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*Contributions to Indian Malacology. No. IV. Descriptions of new land shells from Ava, and other parts of Burma.—By WILLIAM T. BLANFORD, Associate of the Royal School of Mines, F. G. S.*

The species of land shells described in this paper are a few of peculiar interest selected from a numerous collection of novelties obtained in Pegu and Upper Burma. A far larger number remain to be examined, as well as several new species of Estuary and Marine shells from the Irawadi delta and the coasts of Arakan.

I trust hereafter to be able to furnish drawings of the species now described, as well as of those published in a previous number of these contributions.

Genus *SPIRACULUM* *Pearson* : emend.

Shell depressed, sub-discoidal, covered with a thick epidermis, sometimes hairy; aperture circular; last whorl furnished, a short distance behind the mouth, with a short reverted sutural tube, open at both ends, anteriorly inside the body whorl, and posteriorly into the air.

Operculum concentric, horny, multispiral, convex or flat; edges of the whorls externally free and raised, similar to that of *Pterocyclos*.

Animal similar to *Cyclophorus* and *Pterocyclos*, except that the mantle is deeply notched, (in *Sp. Avatum*,) the notch corresponding to the sutural tube.

## 1. *SP. AVANUM*, n. s.

Shell convexly depressed, widely umbilicated, marked with radiating striæ and covered, (in young specimens,) with a thick scabrous

epidermis; colour white, with broad zigzag chesnut stripes crossing the whorls, and a wide submedian band of the same colour surrounding the shell. Spire scarcely raised, suture deep. Whorls  $4\frac{1}{2}$ , rounded; the last cylindrical, descending slightly and gradually towards the mouth, and bearing, 3 mm. behind the aperture, a short reverted sutural tube curved into an arch, so that its posterior termination is close to the suture, and open at both ends. Aperture slightly oblique, circular. Peristome, (in well grown specimens,) double, the inner lip continuous and slightly protruded, angulately incised at the suture. Outer lip expanded and produced, close to the last whorl, into a small vertical tongue-shaped projection. Operculum multispiral, almost flat, with a central prominent nucleus within, slightly concave externally, the edges of the outer whorls being free and slightly raised.

	mm.	inch
Major diameter, .....	17	0.68
Minor ditto, .....	14	0.56
Altitude, .....	8	0.34
Diameter of aperture, .....	$5\frac{1}{2}$	0.25

Hab. Shan Hills, east of the town of Ava.

Of this most interesting shell, I only obtained two specimens, one alive and in good condition, but barely full grown, the other old, worn and dead: one was picked up at the base, the other on the top of the range of hills lying to the east of the beautiful valley, in which are situated the present and former capitals of the kings of Burma.

The genus *Spiraculum* was proposed in 1833, (J. A. S. Vol. II. p. 391) by Dr. Pearson, then Curator of the Asiatic Society of Bengal, for the reception of the anomalous *Sp. hispidum*, and also of *Pterocyclos parvus* from the Khasi hills. Mr. Benson had, a very short time previously, in 1832, published the description of the allied genus *Pterocyclos*, (J. A. S. Vol. I. p. 11) and Dr. Pearson proposed to substitute the name *Spiraculum*, under the idea that the type of Mr. Benson's genus was an imperfectly developed shell. Dr. Pearson was entirely in error, as was shewn soon after by Mr. Benson, (J. A. S. Vol. V. p. 355) whose generic name has been universally adopted, while Dr. Pearson's appellation has been treated a synonym by many authors, by Dr. Pfeiffer amongst others, while the brothers Adams and a few other conchologists have preserved the name *Spira-*



culum, but have restricted it to the only species hitherto described as possessing a tube, viz. *Sp. hispidum*,\* (*Pterocyclos hispidus*). The discovery of a second species shews that this separation is justified. The genus is distinguished from *Pterocyclos* both in the possession of this small tube, which recalls the same process in *Opisthoporus* Bens. and also in the absence of the "wing" or cowl-shaped free process of the outer lip in the peristome of *Pterocyclos*, which is represented by the small linguiform projection of *Spiraculum*. There also appears, if the character of the mantle of *Sp. Avatum* prove constant, to be a distinction in the animals; for although several species of *Pterocyclos* have been carefully examined, no peculiarity in the animal has been found to correspond to the singular formation of the peristome, while in the present species of *Spiraculum* there is a deep notch in the mantle, corresponding to the tube in the shell.

A third and very singular species of *Spiraculum* exists in Assam, but has not yet been described. I am disposed to consider the genus as forming an important link between the *Cyclophoridae*, certain forms of the *Pupinidae*, and the aberrant genus *Alycæus*.

The present species is distinguished from *Sp. hispidum*, Pearson, by its smaller size, by the epidermis being only slightly rough, instead of hairy, and by the sutural tube being nearer the mouth, and bent backwards in the form of an arch. The projection of the outer lip near the suture is vertical instead of horizontal. The operculum is far flatter, resembling in this character, that of the Burmese species of *Pterocyclos* e. g. *Pt. pullatus*, Bens.

## 2. CYCLOPHORUS HISPIDULUS, n. s.

Shell widely umbilicate, subplanulately depressed, radiately striated and marked by extremely fine and close concentric impressed lines, white, covered with a thick dark brown epidermis, which forms a broad raised spiral costulation around the shell, more marked in young than in fully grown specimens. Spire almost flat, apex just exerted, suture deep. Whorls 5, cylindrical, the last descending very little near the aperture, which is subvertical and circular. Peristome double, inner lip continuous and projecting a little; outer lip slightly expanded. Operculum multispiral, externally flat, the margins of the

\* Gen. Rec. Moll., H. and A. Adams, Vol. II. p. 278, the following is the description given. "Shell with a reverted, closed tube or spiracle, situated on the suture near the aperture." The tube is not closed however, but open, the interior aperture being more or less in the form of a longitudinal slit.

whorls being very rough and free, internally very slightly concave, with a minute central nucleus projecting.

	mm.	inch
Major diam., .....	14	0.55
Minor ditto,.....	12	0.5
Altitude, .....	7	0.28
Diameter of aperture, .....	5	0.15

Habitat. Mya Leit Doung, near Ava.

This species, with *C. calyx*, Bens., from Molmain, and *C. pinnulifer*, Bens. from the Khasi hills, forms an extremely well marked section of the genus *Cyclophorus*, having indeed quite as good claim to separation as some acknowledged genera, e. g. *Leptopoma*. All are distinguished from other discoid species by a scabrous epidermis, and an opereulum with raised edges to the whorls externally, thus exactly resembling that of the Burmese forms of *Pterocyclos* and *Spiraculum*, to the former of which genera this little group forms a passage. If considered worthy of separation as a subgenus of *Cyclophorus*, I would suggest for it the name *Scabrina*.

The description of *C. calyx* by Mr. Benson in the Ann. and Mag. Nat. Hist. for 1856 (2nd series, Vol. XIX. p. 228) must have been taken from a dead specimen which had lost both its epidermis and opereulum. In living specimens, brought to me by a collector whom I sent to Molmain, the shell was covered with a scabrous dark epidermis, radiately striated, and with raised spiral lines which, as in *C. hispidulus*, were more marked in young than in adult individuals. The opereulum was slightly concave externally, in consequence of the edges of the whorls being raised and ragged, especially near the circumference; internally it was smooth and nearly flat, with a small central nucleus. *C. calyx* is well distinguished from *C. hispidulus* and *C. pinnulifer* by its smaller whorls, the strong subangulation around the umbilicus, the ornamentation beneath the epidermis, and the markings of the epidermis itself, the raised ridges surrounding the shell being fewer and much more pronounced in *C. hispidulus*.

In *C. pinnulifer* the mouth is larger, and the markings on the epidermis very oblique, instead of concentric, and somewhat irregular. The opereulum is very Pterocycloid with rough raised edges to the whorls.

3. *ALYCÆUS VULCANI*, n. s.

Shell moderately umbilicated, depressly turbinate, thin, translucent, varying in colour from amber to nearly white, rather closely costulated throughout, more strongly upon the inflated portion of the last whorl, and very closely ribbed within the umbilicus. Spire conoid, apex blunt, deep rufous; suture impressed. Whorls 4, rounded, the last moderately swollen at the side, then constricted, and swelling again slightly towards the mouth. Constriction smooth; sutural tube of moderate length, about 2 mm. Aperture oblique, round, peristome crenulately waved on the outer edge, the lowest crenulation forming a rudimentary channel at the base; peristome double, the inner alone continuous, both lips somewhat expanded. Operculum thin, horny, distinctly multispiral, very concave externally, internally convex and with a prominent central nucleus.

	mm.	inch.
Major diam., .....	4½	0.18
Minor ditto, .....	3½	0.14
Alt. ....	3	0.12
Diam. ap. ....	1½	0.05

*Habitat*.—This species abounds on the upper portion of the isolated peak of Puppá, an extinct volcano lying about 40 miles E. S. E. of the town of Pu-gán in the territories of the king of Ava. It is a more globose form than either *A. Succineus*, mihi, or *A. polygonoma*, mihi, to which it is allied. The crenulation of the mouth is perhaps more marked than in any other Burmese species.

4. *ALYCÆUS AVÆ*, n. s.

Shell depressed, openly umbilicated, thin, closely costulated throughout, more strongly upon the inflated portion of the last whorl, white or light amber in colour. Spire very depressly conoid, apex blunt, suture impressed. Whorls 4, the last very little inflated at the side, then moderately constricted; constriction rather long, swollen in the centre, indistinctly costulated. Sutural tube short, about 1½ mm. in length. Aperture circular, diagonal. Peristome thickened, double, external lip expanded, inner continuous and projecting slightly at the base. Operculum, thin, horny, multispiral, very concave externally and convex within, wanting the central boss.

	mm.	in.
Major diam. ....	3½	0.14
Minor ditto, .....	3	0.12
Alt., .....	2	0.08
Diam. ap., ...	1	0.04

*Hab.*—The hills East of Mandalay and Ava.

This species approaches *A. Strangulatus*, Hutt. which is larger and more discoid.

#### 5. *ALYCÆUS RICHTHOFENI*, n. s.

Shell umbilicated, turbinate, rather solid, closely flexuously costulated, more strongly so on the inflated portion. Spire conical; apex rather acute; suture impressed. Whorls 5, rounded, the last moderately swollen at the side, and sub-angulate at the periphery, and more strongly so round the umbilicus, then much contracted, ascending slightly at the inflation, descending considerably behind the aperture. Constriction slightly costulated, crossed by a very prominent vertical ridge. Sutural tube of moderate length, about 2½ mm. Aperture circular, very oblique. Peristome continuous, double, the inner lip projecting slightly, and waved 3 times on the dextral side. Outer lip broadly and flatly expanded. Operc.?

	mm.	in.
Major diam., .....	5	0.2
Minor ditto, .....	4	0.15
Alt., .....	4	0.15
Diam. ap., .....	1½	0.06

*Hab.*—Molmain.

I am indebted to Baron F. v. Richthofen for the only specimen of this shell which has been found. It is perfect, but bleached. The species is quite distinct in type from any Indian or Burmese form with which I am acquainted; it combines a high conical spire with a strong ridge on the constriction, but it recalls somewhat the Javanese *A. Jagori*, Martens. I have much pleasure in naming this interesting little form after the discoverer, to whom I was also indebted for some living specimens of *Raphaulus chrysallis*, Pfr. and other Molmain shells.

#### 6. *DIPLOMMATINA PUPPENSIS*, n. s.

Shell dextral, not rimate, elongately subovate, thin, translucent, light amber in colour, very finely and closely costulated, spire with



convex sides, apex pointed, not acuminate, suture impressed. Whorls 7, the antepenultimate being the largest, last whorl rising considerably upon the penultimate. Aperture vertical, nearly circular, the columellar margin being straight, with an obtuse angle at the base, and furnished with a small tooth internally. Peristome double, orange in colour; both lips expanded, the inner forming a thin callus upon the penultimate whorl. Operc. thin, horny, white, circular, flat, with no distinct spiral structure.

	mm.	in.
Alt., .....	$3\frac{1}{2}$	0.15
Diam., .....	2	0.08
Diam. ap., .....	1	0.04

*Habitat*.—Puppa Hill in Upper Burma with *Alycæus Vulcani*.

The largest species yet discovered in Burma and the most symmetrical, so far as I know, of all Asiatic forms. None of the Burmese representatives of *Diplommatina* shew the strongly acuminate spire, or the great swelling of the antepenultimate whorl which distinguishes the species inhabiting the Himalaya.

#### 7. DIPLOMMATINA EXILIS, n. s.

Shell dextral, not rimate, very slenderly subfusiform, rather solid, moderately, closely and obliquely ribbed throughout. Spire turreted with straight sides, apex obtuse, suture impressed. Whorls  $7\frac{1}{2}$ , rounded, antepenultimate slightly larger than the penultimate. Lower whorl rising a little near the aperture, which is subvertical, slightly inclined downwards, almost circular, the columellar margin being straightened, terminating in a right angle at the base, and bearing a moderate-sized internal tooth. Peristome double, the inner lip being prominent, slightly expanded, and continuous upon the penultimate whorl, but not forming a broad callus; outer lip, slightly expanded, retro-relict. Operc.?

	mm.	in.
Alt., .....	3	0.12
Diam., .....	$1\frac{1}{5}$	0.05
Diam. ap., .....	$\frac{2}{3}$	0.03

*Habitat*.—Mya Leit Doung, Ava.

The most slender species of the genus with which I am acquainted, and easily distinguished by this character from all others, by its long narrow form.

8. *HYPSELOSTOMA BENSONIANUM*, n. s.

Shell moderately umbilicated, turbinate, not distinctly striated, thin, horny. Spire conical, apex papillar and with the axis oblique, suture deep. Whorls 4, the upper ones flattened, the last bulging below the suture, and again at the periphery, (where it bears a prominent rounded keel,) rounded beneath, and compressed towards the umbilicus. It rises somewhat towards the mouth, which is round, nearly vertical, slightly turned upwards, free from the other whorls, and furnished inside with 5 lamellar teeth, 4 of which are equidistant and opposite to each other, at the upper and lower corners of the mouth, so as to form a partial St. Andrew's cross, while the fifth, which is smaller, is close to and above that at the upper corner of the parietal margin. Peristome free, simple, broadly expanded and trumpet-shaped.

	mm.	in.
Major diam., .....	3	0.12
Minor ditto., .....	$2\frac{1}{5}$	0.09
Alt., .....	2	0.08
* Diam. of peristome, .....	1	0.04

*Hab.*—Mya Leit DOUNG, Ava.

The differences between this shell and *Hypselostoma tubiferum*, Benson, hitherto the only known species of the genus, are numerous. That shell has the spire scarcely exerted, while the last whorl ascends so much that the mouth, which is horizontal, is on a level with the apex. In the present species, the spire is conical, the mouth nearly vertical, and the last whorl only ascends very slightly. In *H. tubiferum* also, there are more teeth in the mouth, they are situated further back from the aperture, and are somewhat differently disposed, the upper two lamellæ being produced in front of the others, and forming an imperfect tube. There are also minor differences in striation, umbilicus, &c. Nevertheless the general appearance of the two species is strikingly similar, and the peculiar shape of their whorls and mouth recalls those of the Brazilian genus *Anostoma*, Lam.

*Hyps. Bensonianum* occurred together with *H. tubiferum* on the high limestone peak of Mya Leit DOUNG about 20 miles South of Mandalay, the present capital of the kingdom of Ava. *H. tubiferum* has also been found over a wide range of country. It occurs

on the Tsagyen hills, north of Ava, famous for their marble quarries, and on various hills in Pegu as far south as Henzada. In some places hundreds of specimens may be found adhering, in dry weather, to the surface of limestone rock, upon which alone it appears to occur, in the same manner as species of *Pupa* and *Clausilia* are frequently found in Europe, though rarely in India.

The animal of *H. tubiferum* is very small and black, of the usual Helicoidous form, with 4 tentacles, and so far as I could observe, presented no peculiarity.

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*A memoir on the Rats and Mice of India.*—By EDWARD BLYTH.

The following must be regarded as merely a somewhat rude attempt to reduce the present utter chaos of Indian *Muridæ* to some kind of approximation to systematic order; at all events, to present a *Conspectus* of the long series of names and descriptions, that should facilitate the future study of these small animals, and conduce eventually, no doubt, to an extensive reduction of the number of named species, and to the rectification of their perplexed synonyms. At all events, I have brought together every notice which I could find, descriptive of the *Murine* animals of India and the countries adjacent.

Genus GERBILLUS, F. Cuvier.

The Gerbilles are a group of burrowing field-rats, common (as a genus) to Asia and Africa, of gracile form, with small fore-limbs and inversely developed hind-limbs, a longish furred tail, the hairs of which are gradually lengthened towards the extremity into a kind of tuft, and with distinctly grooved upper rodential tusks. There appears to be one Indian species only.

*G. INDICUS*; *Dipus indicus*, Hardwicke, *Tr. Lin. Soc.* VIII. 279, pl. 7; F. Cuv., *Mamm. Lithog.*, II, t. 73 (not good); Hardwicke, *Ill. Ind. Zool.*—*G. Cuvieri*, Waterhouse, *P. Z. S.* 1838, p. 56;—*G. Hardwickei*, Gray, *Br. Mus. Catal., Mamm.*, p. 132;—*Meriones apicalis* (?), Kuhl, apud Gray; *Mus jencus*, B. Ham., *M. S.*; ‘Desert Rat’ of Elphinstone’s ‘Cabul’ (*vide* Introduction).<sup>\*</sup> For description of habits, *vide* W. Elliot, Esq., in *Madr. Journ. Lit. Sc.* X, 211.

<sup>\*</sup> The ‘Desert Rat’ of Arthur Conolly, ‘Overland Journey to India,’ I. 54, refers to the Jerboa (*ALACTAGA INDICA*, erroneously so called, of Gray).

On careful comparison of numerous specimens from Afghánstân, Sindh, Upper Hindustan, Lower Bengal, Midnapore district, Madras Presidency, and Ceylon, I am satisfied that all belong to one and the same species; the differences which have been stated to exist being merely indicative of individual variation.

A second species, however, inhabits Afghánstân,—the *G. ERYTHROURA*, Gray, *Ann. Mag. N. H.* X, (1842), p. 266: *vide* also *J. A. S.* XV. 139, Dr. Gray states—"Hab. *India*, Afghánstân." I doubt if it inhabits India, any more than does his *Alactaga indica*, *ibid.* p. 262, from "*India*, Candahar, at Quetta;" or his *LAGOMYS RUFESCENS*, *ibid.* p. 266, from "*India*, Cabul;" these latter animals are not at all likely to be found on the Indian side of the passes into Afghánstân, but are inhabitants of a region possessing essentially an European climate.

#### Genus NESOKIA, Gray.

*Ann. Mag. N. H.* X. (1842), p. 264. "Cutting teeth very large, flat in front, and smooth; grinders 3-3; front upper, large with three cross ridges; the middle oblong, and the hinder much narrower behind, each with two cross-ridges; hinder each with two ridges, the hindmost smallest, rather narrow behind; tail short, thick, with whorls of scales and scattered bristles; toes 4-5, moderate, the three middle sub-equal, long, the outer moderate; claws small, compressed; front thumb tubercular, with a rudimentary claw; ears moderate, naked.

"This genus is easily known from *Mus* by the large size of the cutting teeth and the comparative shortening of the tail; it appears to be intermediate to the Rats and *RHIZOMYS*," (J. E. Gray).

I have studied both *MOTOMA* and *RHIZOMYS* alive, in their indigenous haunts, and living examples of both of them; and can perceive no particular approximation in the instance of these two genera.

*N. INDICA*; *Mus indicus*, Geoffroy, Desmarest, p. 474; Lesson, *Manuel*, p. 266; Brandts *Maiz*, p. 114, t. 35; Schinz, *Synopsis Mammalium*, II. 174; *Arvicola indica*, Gray, *Hardw. Ill. Ind. Zool.*

"*M. supra cano-rufescens, subtus canescens; pedibus dorso concoloribus, cauda corpore paululum brevior; auriculis magnis, rotundatis, fuscis, nudiusculis; cauda nigricante. Pili omnes basi cani. Magnitudine M. decumani. Habitat. circa Pondichery.*"

In his Catalogue of the specimens of mammalia in the British Museum, Dr. Gray cites the name *M. indicus*, Geoffroy, as a synonym of his *Mus Kok*; the former name having the priority by many years; but in his subsequent Catalogue of the specimens presented by B. H. Hodgson, Esq. to the British Museum, Dr. Gray gives *M. indicus*, Geoff., as a separate species, and refers to



it the *M. rattus* (?) v. *rattoides* of Hodgson, the description of which indicates a very different animal, with tail longer than the head and body. He also dubiously refers the *M. brunneusculus*, Hodgson, to the same.

This is undoubtedly the common shortish-tailed field Rat of all India, with Ceylon; varying somewhat in shade of hue according to the colour of the soil on which it dwells. Though the reverse of gracile in its appearance, with much of the aspect of an *arvicola*, it is marvellously rapid in its movements, as it plays about the entrance of its burrow!\* And the type, if not the same species, occurs in Afghánstân; but I have not seen it from the eastward of the Bay of Bengal though it is likely enough to occur in the dry climate of the region of the upper Irawádi.

The Indian animal is excellently described by the Hon'ble Walter Elliot, in the *Madras Journ. Lit. Sc.* X, 209 (1839), by the name *Mus* (*Neotoma*) *providens*, with *M. indicus*, Geoff. and *Arvicola indica*, Gray, cited as synonyms, and the Canarese name *Kok* or *Koku* also assigned to it.† He gives an elaborate account of the habits of the animal; and remarks that—"A variety found in the red soil is much redder in colour than the common *Koku* of the black land. Another variety, he adds, "is said to frequent the banks of nullahs, and to take to the water when pursued; but the specimens I have seen differed in no respect from the common kind, (of which they appeared to be young individuals,) except in size." "The dimensions of an old male were as follow:—length of body, 7 in.; of tail  $6\frac{1}{2}$  in. [!] sole  $1\frac{4}{16}$  in., weight 6 oz. 5 dr." According to my observation, the tail has not exceeded  $5\frac{1}{2}$  in., from any part of the country.

In the *Proc. Zool. Soc.* for 1835, p. 108, it is recorded that specimens were exhibited of eight species of Rats and Mice, collected in India by Walter Elliot, Esq. They were brought under the notice of the meeting by Mr. Gray, who stated that five of them were hitherto undescribed \* \* \*. The mouse which Mr. Gray has figured from Gen. Hardwicke's drawings, in the 'Illustrations of Indian Zoo-

\* The species of RHIZOMYS are rather slow in their movements.

† "It seems necessary," remarks Mr. Elliot, "to distinguish this species by a new name, that of *indicus* being too general and indefinite. Geoffroy's animal is not sufficiently particularized, to indicate which of the Indian species he meant; and Gray's was given under the supposition that it applied to an ARVICOLA, which, he subsequently discovered, it did not (*P. Z. S.* 1835, p. 108). The present term seems sufficiently applicable to its habit of laying up a large store of grain for its winter food."

logy,' under the name of *Arvicola indica*, is really a *MUS*. A second time, therefore, the specific name *INDICUS* claims priority. Mr. Elliot subsequently presented specimens of this common Indian field Rat to the Society's Museum, which are before me as I now write.

In the *Mag. Nat. Hist. n. s. I.* (1837), p. 585, Mr. Gray describes a *Mus Kok* (!), with the synonym of *Arvicola indica*, Gray. "Length of body (dry)  $9\frac{1}{2}$  in., tail  $4\frac{1}{2}$  in.; hind-feet  $1\frac{3}{4}$  in. Inhabits India." Doubtless from one of Mr. Elliot's specimens; but how different the admeasurements taken from a dry skin! On the same occasion he describes a *Mus Hardwickei*. "Very much like *M. Kok*, but the skull is much wider and stronger, and rather larger; and the cutting teeth are nearly twice as wide, and are flat in front. The grinders are very little larger than those of that species. Inhabits India; gardens." I considerably suspect that these are merely adult and young of the same species! With numerous specimens before me from Lower Bengal, the Midnapore district, the Carnatic, S. Malabar, and Ceylon, I can recognise one species only, varying a little in shade of hue from different localities, and also somewhat in quality of fur, unless this latter difference may prove to be seasonal, as is not improbable. In his catalogue of the specimens of Mammalia in the British Museum, p. 110, Mr. Gray retains his *M. Kok* under *MUS*, and gives as synonym *M. (Neotoma) providens*, Elliot, *Arvicola indica*, Gray, and also *MUS INDICUS*, Geoffroy. (Why, therefore, not adopt this last and much the oldest name for the species?). And at p. 113, well removed from the former, he gives *NESOKIA HARDWICKEI*, v. *Mus Hardwickei*, Gray, and no other species is referred by him to *Nesokia* in that catalogue. But in his catalogue of the specimens and drawings of Mammalia and birds of Nepal and Tibet, presented by B. H. Hodgson, Esq., to the British Museum (1846), the *Kok* v. *providens*, is assigned to *Nesokia*.\*

So common and widely diffused a Rat as this is, throughout the plains of India, must needs be found in the valley of Nepal; and, if so, will be sure to have received one or more names from Mr. Hodgson.

\* The late Dr. Kelaart, in his *Prodromus Faunae Zeylanicae*, recognises apart *Nesokia Hardwickei*, Gray, (*Mus dubius*, Kelaart), and *Nesokia Kok*, Gray (*Arvicola indica*, Gray, and *Neotoma providens*, Elliot). A Cinghalese specimen presented by him to the Society is undoubtedly of the common Bengal species. His *N. Kok* appear to have been described from a distorted stuffed specimen, of at most a slight individual variety to the best of my judgment; and he states of it "Dentition as in the last species." (!)

One and probably more than one of the following descriptions in the *Ann. Mag. N. H.* XV. (1845), pp. 267—8, are likely to refer to *M. INDICUS*; and not any of these names occur either in the *Br. Mus. Catal.* of Dr. Gray, nor in the late Dr. Horsfield's Catalogue of the specimens of Mammalia in the India-House Museum, (1850); but some of them are noticed, as will be shewn, in the *Br. Mus. Catal.* of Mr. Hodgson's specimens.

"*MUS* ? *PYCTORIS*,\* H. characterized by its bluff face with short thick muzzle, and by its short tail, one-third short of the length of the animal. Pelage of two sorts, with the long piles sufficiently abundant, colours of *rattoides*, or of dusky-brown, with a very vague rufous tinge. Below fulvescent; long hairs all black; rest with hoary bases and black points. Inner piles mostly dusky. Snout to vent 7 in.; tail  $4\frac{1}{2}$  in.; head  $1\frac{7}{8}$  in.; ears  $\frac{1}{16}$ ; palma  $\frac{5}{8}$ ; plauta  $1\frac{1}{4}$ . Tenants the woods only;"—i. e. open jungle? (I take this to be a synonym of *NESOKIA INDICA*.)

"*MUS MYSTRIX*, H. Remarkable for its soft mouse-like pelagi, and for its tail covered with hairs, so as to conceal the annulated skin nearly. Fur soft, short, and of one kind only; colours clear; above dull fawn, below fulvescent. The piles above are dusky at their roots, black in their centres, and red at their tips. The tail is still shorter than in *Mus* ? *pyctoris*, being not two-thirds of the length of the animal. Snout to rump 6 in.; tail  $3\frac{1}{2}$ ; head  $1\frac{1}{2}$ ; ears  $\frac{1}{16}$ ; palma  $\frac{7}{16}$ ; plauta  $1\frac{1}{16}$ . Tenants the woods only, dwelling in burrows under the roots of trees, but not gregariously." (*Qu.* young of *NESOKIA INDICA* ?)†

"*MUS* (?) *HYDROPHILUS*, H. [*Arvicola hydrophilus*, H., *J. A. S.* X. 915, [apud Gray]. Small Water-Rat of Nepal. Dwells in holes on the margins of ponds and rivers: characterized by its small ears, which are hardly above one-third the length of the head; also by its short tail, and by a pelage that is short and fine, though not so mouse-like as in the last. Above dusky-brown, below and the limbs nearly white. Long piles inconspicuous. Head larger and muzzle thicker than in the common land Rats. Snout to vent  $3\frac{1}{2}$  in.; tail  $2\frac{3}{4}$  in. head  $1\frac{1}{4}$  in.; ears  $\frac{1}{16}$  in.; palma  $\frac{1}{2}$ ; planta  $\frac{7}{8}$ ."‡

\* In *Br. Mus.*, a "specimen with skull, in very bad state." Also a "drawing, of natural size"—"Inhab. Nepal, central and northern hilly region." "Fur soft, dark brown, minutely gray varied, with scattered narrow, white bristles. Lower cutting teeth very narrow, rounded in front, middle of belly whitish. Tail nakedish. Hind-feet 1 in. 3 lin.; tail 4 in.; (imperfect) body and head 7 in.; skull  $1\frac{1}{2}$  in." (Gray).

† In *Br. Mus.*, "a flat skin, without fore-limbs; tail skinned at the end;" and "a drawing of natural size." "Inhab. Nepal, central and northern hilly region." "Fur yellow-brown, minutely black-varied; hair rather short and rigid, lead-coloured, with yellow tips, and with scattered narrow black bristles; beneath yellowish-white; tail hairy, yellow, hind feet 1 in.; tail  $3\frac{3}{4}$  in." (Gray.)

‡ *NESOKIA HYDROPHILA* apud Gray; who also admits his *Nesokia* (!) *kok* from Nepal, v. *M. providens*, Elliot, &c. In *Br. Mus.*, a "specimen without tail, imperfect skull, and drawing of adult and young, nat. size. Grey-brown, beneath whitish; fur very soft, with rather elongated, very slender, soft, longer hairs;

"MUS (?) MACROPUS, H. A Water-Rat like the last, but twice as large. Distinguished by the largeness of its feet, and also by the fine pelage and the proportions of the last, as well as by a similar bluff face, though less so than in *M. (?) pectoris*. Above smoky black, below smoky-grey. Legs dark, toes pale. Snout to rump  $7\frac{1}{4}$  in.; tail 6 in.; head  $2\frac{1}{8}$  in.; ears  $1\frac{1}{8}$  in.; palma plus 1 in.; planta  $1\frac{3}{8}$  in.; weight 6 oz." (Hodgson.)

In *J. A. S. XV.*, 139, I referred a species from the extreme *N. W.* of India and Afghánstân, to this *Nesokia* group by the name *Mus Huttoni*, nobis; and Mr. F. Moore has since described a *Nesokia Griffithii*, Horsfield, from Afghánstân, in the Catalogue of the Indian-House specimens of mammalia, which is probably the same animal, notwithstanding certain discrepancies in the descriptions.

*N. HUTTONI*, nobis—"Bears a near resemblance to *M. INDICA* (v. *kok*), but the tail is shorter and the general colour much lighter, resembling that of the Gerbilles. On comparison of the skulls, the Zygomatic arch is seen to be conspicuously broader anteriorly; and the palate is much narrower, and contracted to the front: but the most obvious distinction consists in all the teeth, both incisive tusks and grinders, being considerably broader and stronger. In other respects, the skulls of these two species bear a very close resemblance. Length, minus the tail, about 6 in.; the tail, (vertebræ,) 4 in.: tarsus with toes and claws,  $1\frac{3}{8}$  in.; ears posteriorly  $\frac{1}{2}$  in.; to anteal base  $\frac{5}{8}$  in. Fur soft and fine, blackish for the larger basal half of the piles—the surface pale rufescent-brown, deepest along the crown and back, pale below, and whitish on the throat; whiskers small and fine, and chiefly black; tail naked; feet light-brown: incisive tusks buff-coloured; the enamel of these has been partially worn away on those of the upper jaw." (Bl.)

This animal "occurs south of Bwhawulpore, and is abundant in Afghánstân, from Quetta to Girishk, throwing up the mould after the manner of the mole. It feeds on herbs and seed, and burrows in the ground beneath hedge-rows and bushes, as well as along the banks and ditches. Its nest is deep-seated, and it constructs so many false galleries immediately below the surface, that it is difficult to find the true passage to its retreat, which dips down suddenly from about the middle of the labyrinth above. In the gardens and along the sides of water-courses in the fields at Kandahar, their earth-heaps are abundant." (Hutton.)

*NESOKIA GRIFFITHII*, Horsfield "Fur very soft and silky: colour above, dusky chesnut-brown with streaks of a plumbeous tint, the separated hairs being of a leaden-colour at the base, and chesnut-brown towards the extremity; chin, chest, and under parts of a lighter tint, passing into a greyish-leaden colour on

ears moderate, rounded; whiskers black at the base, slender, weak: front cutting teeth broad, yellow: grinders very large, much larger than in *Mus bandicota*. Hind-foot 1 in. 8 lin.: skull to back of palate 1 in.  $1\frac{1}{2}$  lin.; grinders  $4\frac{1}{2}$  lines long and 2 lines wide." (Gray).



the abdomen. Ears moderately large: thumb of the fore-feet very minute. Cutting teeth flat anteriorly, comparatively large, broad and nearly white. Tail nearly naked, and shorter than the body. Length from snout to root of the tail,  $6\frac{1}{2}$  in.; of the tail 3 in. Hab. Afghánstán, Pushut. (F. Moore.)

The skin of the body of the specimen was probably a little stretched, and that of the tail shrunk, if the caudal vertebræ were not retained within it, as is very commonly the case with skins prepared for stuffing of this group of animals.

All of the foregoing names are applied to animals of a bluff *arvicoline* or vole-like aspect, with tail shorter than the head and body; excepting the *M. rattus* et *rattoides* of Hodgson, which Dr. Gray refers to *M. indicus* as adopted by him, whatever that species may prove to be, though it does not seem likely to turn out a *Nesokia*, and is not classed as such by Dr. Gray.

MUS BANDICOTA, Bechstein; founded on the *Bandicota Rat* of Pennant's 'Quadrupeds,' p. 377; the name, according to Mr. Elliot, being a corruption of *Pandi-Koku* (literally Pig-rat), Telegu, of the Wuddur caste, S. India:\* *M. giganteus* Hardwicke, VII. p. 306, t. XVIII.; *M. perchal* et *M. malabaricus*, (Pennant) Shaw; *M. ikria*, B. Ham. (*ined.*); *M. nemorivagus*, Hodgson, *Ann. Mag. N. H.* XV. (1845), p. 206, *J. A. S. V.* 234, *M. (Neotoma) giganteus*, Elliot, *Madr. Journ. Lit. Sc.* X. 209 (who thus classes it in the same particular division as the NESOKIA INDICA).

Gen. Hardwicke figures and describes this huge Rat of extraordinary size; stating that—"The subject here described and figured was a female. Its weight was 2 lbs.  $11\frac{1}{2}$  oz. Its total length  $26\frac{1}{4}$  in., of which the tail measured from root to tip 13 in. The male grows larger and weighs 3 lbs. and upwards." Hence Mr. Hodgson was induced to consider his *nemorivagus* as distinct, being about one-third smaller. He gives:—snout to rump 12 in.; tail  $9\frac{1}{2}$  in.; weight 17 to 20 oz. "A full grown male," according to Buchanan Hamilton (*MSS.*), "measures  $10\frac{7}{10}$  in. from nose to tail, and the tail  $8\frac{3}{4}$  in." The stuffed specimens in the Society's collection are from Ceylon; and measure:—the head and body about 13 in., and tail (vertebræ)  $9\frac{1}{2}$  in. These well agree with Buchanan Hamilton's published figure.

I find, however, on reference to the late Dr. Kelaart's *Prodromus Faunæ Zeylanicæ*, that a large Cinghalese Bandicoot Rat measured

\* In Australia, the appellation 'Bandicoot' has been currently adopted for a genus of small marsupial animals, the *Perameles* of Shaw.

—“head and body 14 in.; tail 13 in.; weight 2 lbs. 10 oz. Rarely are larger specimens found.”

Dr. Kelaart continues—“The Bandicoot is found in all parts of the island. Those from Newera Ellia are particularly large, and of a darker colour than those from the maritime provinces. A specimen found in the neighbourhood of Kandy, had a rufous tinge on the posterior portion of the back.\* \* \* These animals are very destructive to grain-crops. At Newera Ellia, they are the farmers’ pest; fields of potatoes and beds of peas are much injured by these rapacious creatures; and the dove-cot and poultry-yards are not exempted from their attacks. Some classes of Malabars are very partial to the flesh of these Rats, and they are much sought after by the coolies on coffee estates, who eat them roasted.”

The late Dr. Cantor includes this species in his catalogue of the Mammalia inhabiting the Malayan peninsula; but I have never seen it from the Indo-Chinese region. It inhabits various parts of India; but I never succeeded in procuring a fresh specimen from the vicinity of Calcutta. It is not unusual, however, here as elsewhere, to hear a full-grown *MUS DECUMANUS* designated a ‘Bandicoot.’ This huge species would seem to be intermediate in habits as in structure, to *M. INDICTUS* and *M. DECUMANUS*.\*

*M. SETIFER*, Horsfield, figured in his Zoological Researches in Jáva: *M. giganteus* juv. Temminck, apud Gray. “Allied to the *M. BANDICOTA*, but clearly distinct as a species.” Horsfield’s Catalogue. Inhabits Sumátra, Jáva and Borneo; and Dr. Cantor gives it from the Malayan peninsula (Penang), *J. A. S.* XV. 254. “The larger of two individuals, captured in gardens, measured:—head and body  $10\frac{1}{8}$  in.; tail  $7\frac{1}{2}$  in.” (Cantor.) In his *Br. Mus. Catal.*, Dr. Gray mentions a ‘black variety,’ and a “brownish variety with face brown” from Tasmania! In the ‘Zoology’ of the voyage of the ‘Samarang,’ Dr. Gray has attempted a *Conspectus* of the Zoology of the Malayan peninsula and islands, wherein he includes but five species of *MUS*; viz., *M. SETIFER*,—*M. BANDICOTA*, from the Malayan peninsula, Jáva, and Sumátra, *M. DECUMANUS*, Pallas from Jáva, Sumátra, Banda, Borneo, Celebes, Amboyna, Timor, Malayan peninsula (Penang).

\* A “specimen, from Egypt,” is given in the *Br. Mus. Catal.*, as the Egyptian Bandicoot, *M. GIGAS*.

*M. RUFESCENS*, Gray, apud Gray (*flavescens*, Elliot), from Penang, on the authority of Cantor; and *M. MUSCULUS* (?) apud Cantor, from Penang. We possess two specimens from Malacca, which bear considerable resemblance to each other except in size; but one is certainly not the young of the other, as shewn by the comparative size of the feet. Had they been of the same species, the feet of the smaller specimen would have been considerably larger. The larger of the two is perhaps the young of *M. SETIFER*; measuring about  $6\frac{1}{2}$  in. long: tail  $5\frac{1}{2}$  in.: hind-foot  $1\frac{7}{16}$  in.: auricles of medium size, naked: tail with close rings fringed with short setæ: fur rather coarse on the upper parts, approaching to the spinous character, and the soft under-fur not shewing at the surface; of an uniform yellowish rufescent brown above, a little paler below, passing into dull albescent on the throat: the whiskers reach to beyond the ears, and are of a shining dark brown colour; and there are only a few fine long hairs protruding beyond the general surface of the fur of the back; the smaller specimen appears to be the young of *M. ROBUSTULUS*, nobis, and is doubtless the *M. RUFESCENS* apud Cantor; but its fur tends somewhat unusually to be weakly spinous. The general colour is of a dull *murim*-brown above, slightly albescent below, passing to dull white on the throat. Length of head and body about  $4\frac{1}{3}$  in.; and of hind-foot  $1\frac{5}{16}$  in., *Mus setifer* is included in *M. ?* of E. L. Layard's 'List of the Mammalia observed in Ceylon,' *Ann. Mag. N. H.*, 2nd series, VII. (1851), p. 405; but not in Dr. Kelaart's *Prodromus Faunæ*.\*

*MUS DECUMANUS*, Pallas, *Glires*, 91; Buffon, *H. N.* VIII. t. 27: *M. javanus*, Pallas, apud Schinz, *M. norvegicus*, Buffon. To this species Dr. Gray refers (with a mark of doubt), in his Catalogue of Mr. Hodgson's collection, the *M. decumanoides*, Hodgson, (*nec* Waterhouse, *nec* Horsfield), which does not appear to have been described; also *M. brunneus*, Hodgson, *Ann. Mag. N. H.* XV. (1845), 267; described as follows:

'*Mus brunneus*, H. Common house rat of Nepal. As nearly allied to *decumanus* as *nemorivagus* is to the Bandicoot, [*i. e.* identical]; above rusty-brown; below rusty, more or less albescent. Extremities pale, fleshy-white nearly. Tail barely longer than the head and body. Long piles sufficiently numerous,

\* Another species has been (or is to be) described from those islands, by the same naturalist, as *M. PALMARUM*. I have not seen any description. The name would indicate the habits of *MUS RUFESCENS*.

but not rigid. Snout to vent  $9\frac{1}{4}$  in.; tail  $9\frac{1}{2}$  in.; head  $2\frac{1}{4}$  in.; ears 1 in.; palma  $\frac{7}{8}$  in.; planta  $1\frac{1}{8}$  in.; weight 12 to 15 oz. (Hodgson)."

"*M. brunneusculus*, H. Lesser Brown Rat of Nepal. Closely resembling the last, but considerably smaller, as proved by numberless specimens: above rusty-brown, below rusty. Extremities pale. Snout to vent  $8\frac{1}{4}$  in.; tail 9 in.; head  $2\frac{1}{4}$ ; ears 1; palma —?; planta —?; weight 9 to 10 oz." (This as before remarked, Dr. Gray assigns dubiously to *M. indicus*, Geoffroy, *apud* Gray; nec *M. indicus* *apud* nos.)

In the *Ann. Mag. N. H., N. S.* XVI. (1855), p. 112, Dr. Horsfield describes:—

"*Mus tarayensis*, Hodgson. Nearly allied to *M. brunneusculus*. Colour of the body and head above, dark brown, delicately variegated with blackish and rufous hairs; a very slight gloss on the surface. Outer sides of the extremities, rather darker. Under parts from the chin to the vent, and inner parts of the extremities, greyish-brown, with a rusty shade. Tail shorter than the body, tapering to an abrupt tip.\* Head lengthened and compressed, muzzle gradually tapering to an abrupt tip—*Distinguishing character*. A dark-brown surface with a slight gloss. Head lengthened. Tail shorter than the body. Underneath rusty-grey. Mr. Hodgson's collection," continues Dr. Horsfield, "contains only a single specimen, and further observations are required to confirm the distinctness of this species."

*MUS PLURIMAMMIS*, Hodgson, *ibid.* "Colour above, brown, with a rufescent shade; fur soft, consisting of brown and rufous hairs intermixed in equal proportions, forming an uniform upper surface; a rather obscure band extending from the gape over the cheek, terminating under the ears; and the abdomen and adjoining parts, rufous-grey. Head proportionally short, muzzle abrupt, ears moderate. Tail equal in length to the body, tapering to a sharp point, and minutely annulated. Length of the head  $2\frac{1}{2}$  in.; of the body from the neck to the snout  $5\frac{1}{2}$ ; of the tail the same."

"The distinguishing character, according to Mr. Hodgson," remarks Dr. Horsfield, "rests on the number of teats exceeding that of other species; but the number is not stated!" This is perhaps a *GOLUNDA*?

Dr. Kelaart called "the attention of observers to a yellow reddish-brown variety of the common house Rat, found at Trincomali and Batticaloa which may probably," he suggested, "be the *Mus decumanoides* of Hodgson:—this Rat may be thus described;—above, dark yellowish-brown, with long thin black hairs. Beneath, dingy, or yellowish-ash, with a few long grey hairs. Shorter fur of the back very similar to that of *M. rufescens*, (Gray, v. *flavescens*, Elliot); but much darker and of a slight rufous or reddish shade on the rump and posterior limbs. Base of hairs ash. Feet brown; soles purplish. Length of head and body  $7\frac{1}{2}$  in.; tail  $8\frac{1}{2}$  in.; planta 1,  $1\frac{1}{10}$  in. This is the common

\* *Qu.* Mutilated and healed? E. B.



house Rat of Trincomali, smaller than the *MUS DECUMANUS*,\* of which we have seen only a few specimens in Trincomali, where it is rare in houses in the town; but abundant in the dock-yard. *MUS DECUMANUS* is not very common in the hilly parts of the island: other Rats seem to replace it altogether on still higher parts. At Newera Ellia, where we resided for seven months, not one was observed. But it will not be long, ere the Brown Rat will find its way there also. (*Prodromus Faunæ Zeylanicæ*, pp. 60-1.)

Dr. Kelaart also describes—

“*MUS CEYLONUS*, Kelaart. Fur soft, lead colour; hair of upper parts tipped with dark fawn and black. Ears large, naked. Whiskers tinged black. Tail longer than the head and body, scaly. Head and body  $4\frac{3}{4}$  in.; tail 6 in. This small Rat is found in out-houses in the cinnamon gardens at Colombo. I have no reason to think it to be the young of the former species. The teeth were well developed. The darker colour and long tail will easily distinguish this species from other Colombo Rats.” (*Ibid.*, p. 61.)

The common European Brown Rat is nowhere a more intolerable nuisance than in Calcutta and its vicinity: but it is not generally distributed over the interior of the country. In S. India Mr. Elliot states that “it is not so common above the Ghâts as below.” Col. Sykes, however, states that “the Norway or Brown Rat abounds in Dukhun.” I observed it to be very numerous at Akyab; but further south, at Rangoon and Moulmein, also in Tavoy and Mergui, I remarked no traces of it; nor have we ever received specimens from that line of coast; though Dr. Cantor gives it from Penang, and notes it as “*cosmopolita*.” Other sites in the intertropical Eastern Archipelago are noted in p. 334; and the nuisance that Dr. Kane found this species to be in the course of his arctic explorations is sufficiently described in his most interesting narrative. In N. America, Mr. Catlin describes its first appearance among the wigwams of the far west, where its advent was rather hailed at first by the red men, on account of its attacking and destroying the indigenous *MERIONES*; but it fast proved to be by far the greater pest of the two, and soon domiciled itself as completely among the red men as elsewhere. According to Fischer, this noxious animal was introduced into Europe about the year 1730, and the current statement is that it originated in Persia or its vicinity; if so, it should at least have spread into

\* “A large Brown Rat at Colombo measured, the head and body 10 in., and tail 11 in.” (Kelaart.) A specimen with which he favored the Society as an example of his small house Rat of Trincomali appears to me to be a half-grown *M. NEMORALIS*! and a tailless specimen from Newera Ellia appears to be quite similar.

Afghánstân, where, according to Capt. T. Hutton, it would seem to be unknown in Kandahar (*J. A. S.* XV. 140). According to Mr. F. T. Buckland, "it made its appearance in Paris about the middle of the eighteenth century, and in England not many years earlier. It is now agreed by most naturalists," remarks this author, "that it is a native of India and Persia; that it spread onwards into European Russia, and was thence transferred by merchant-ships to England and elsewhere." (*Curiosities of Natural History*, 5th Edit. p. 62.)

If an indigenous inhabitant of *India*, it would undoubtedly be more generally diffused over this, if not also the neighbouring countries. I suspect that the trans-Baikalian region of E. Asia has at least as good a claim to the *discredit* of originating the abominable Brown Rat as any other. *MUS DECUMANUS* is included in the list of Mammalia inhabiting the Amur territories by Mr. E. G. Ravenstein, in his 'Russians on the Amur,' &c., (1861), p. 316; and again, at p. 323, "It is owing to the rapacity of the *MUS DECUMANUS* that the Tunguzians build their store-house on four poles, to keep the contents beyond its reach; and among the Goldi the Manchus are nicknamed 'Sungari,' *i. e.* *Rats*, on account of the rapacity with which they exact tribute." Whatever the extremes of temperature and climate, *MUS DECUMANUS* contrives to find itself a home, and to increase and multiply about human abodes and granaries, to the serious detriment of not quite all-subduing man! Calcutta specimens are undistinguishable from British; and I observe no marked difference in one received from Amoy, except that it is in finer pelage and rather brighter coloured than usual.

*M. DECUMANOIDES*, Temminck (*nec* Hodgson), is given in Dr. Horsfield's Catalogue of the Mammalia in the India House Museum: "two specimens, from Bengal, presented by Gen. T. Hardwicke." I have seen no description. Surely not *M. nemoralis*, nobis?

*MUS RATTUS*, L. (Buffon, *H. N.* VII. 278, t. 36.) The European Black Rat I have only seen from vessels in the port of Calcutta, which differs in no respect from others received from France. Mr. Elliot, in his 'Catalogue of Mammalia in the Southern Mahratta country' notes it as "rare," and Mr. Layard includes it from Ceylon, where Dr. Kelaart obtained one individual in a house, in Trincomali, remarking that he had

not seen it from any other part of the island. "No doubt," he adds, the Black Rat has been introduced by ships which frequent the various ports of the island." This, and not *M. DECUMANUS*, is said to be the species which has overrun New Zealand, and is there supposed to have exterminated the frugivorous native Rat of the country, stated to have been of frugivorous habits.\* The *M. rattus* v. *rattoides* of Hodgson, Dr. Gray refers to *M. INDICUS*, Geoffroy. It is thus described.

"*M. rattoides*, H. Black Rat of Nepal as similar to the Black Rat of Europe, as the foregoing, [*M. brunneusculus*,] is to our Brown Rat, and bearing in Nepal the same relation the one to the other as in Europe. Above, dusky or blackish brown; below, dusky hoary. Limbs dark, fingers pale; tail decidedly longer than the body and head; long piles sufficiently numerous. Snout to vent  $7\frac{1}{2}$  in.; tail  $8\frac{3}{4}$ ; head  $1\frac{7}{8}$ ; ears  $\frac{7}{8}$ ; palma  $\frac{1}{2}$ ; planta  $1\frac{1}{2}$ ; weight 5 to 7 oz."

Specimens presented by Mr. Hodgson to the British Museum are marked as "A. B. Reddish, bad state. C. B. Rather brown, not good state. G. I. Three skulls, J? Var. darker, with whitish bristles, no hind-feet. *M. brunneusculus*, Hodgson E. (?)"

\* Referring, however, to the 'Fauna of New Zealand' in Dieffenbach's work, I find that he cites *MUS RATTUS*, L., with a note of doubt; and adds—"It would be interesting to see whether it is the European, the Indian, or the New Holland Rat, that has been introduced, or if there may not be more than one kind." What he means by the *European* or the *Indian* Rat is not so clear. But he adds—"There exists a frugivorous native Rat, called *Kiore maori* (indigenous Rat) by the natives, which they distinguish from the English Rat, (*not the Norway Rat*), which is introduced, and called *Kiore pakia* (strange Rat). On the former they fed very largely in former times; but it has now become so scarce, owing to the extermination carried on against it by the European Rat, that I could never obtain one. A few, however, are still found in the interior, viz., at Roturua, where they have been seen by the Rev. Mr. Chapman, who described them as being much smaller than the *Norway* Rat. The natives never eat the latter. It is a favorite theme with them to speculate on their own extermination by the Europeans, in the same manner as the English Rat has exterminated their indigenous Rat." (Dieffenbach's *Travels in New Zealand*, &c., II. 185.)

Mr. F. T. Buckland, however, quoting the *Field* newspaper, on the subject of the imported Rat of New Zealand, mentions that "with the exception of a small species of Rat, now nearly extinct, having been all but exterminated by the importation of the common *Norway* Rat, there is not a single indigenous animal [mammal] in the country; the Rats have become a serious nuisance." (Vide, however, p. 168 *antea* regarding a small aquatic furred quadruped not improbably an *ORNITHORHYNCHUS*.)

Of *MUS RATTUS*, Mr. Buckland writes—"The Black Rat, or as it is sometimes called the old English Rat, does not seem to be an aboriginal occupier of the British soil. The earliest mention of it is by Genver, in his *Historia Animalium*, published at Zurich about the year 1587. It is probable that it was introduced into Britain from France, the Welsh name for it being to this day, as I have it from a gentleman of Welsh extraction *Ilygoden Frenziz*,—the 'French mouse.' " Certainly, the remains of neither *MUS RATTUS* nor of *M. DECUMANUS* have been found fossil in the British island, as those of *ARVICOLA AMPHIBIA* are so abundantly.

In a late No. of the Proceedings of the Linnæan Society\* it is shewn that, in London, the *M. DECUMANUS*, *M. RATTUS*, and *M. ALEXANDRIANUS*, interbreed and commingle, yielding fertile hybrids of all degrees of intermediateness.

*MUS ANDAMANENSIS*, Blyth, *J. A. S.* XXIX. 103. *M. Nicobaricus* (?) Scherzer, 'Zoology of *Novara* Expedition.'

The indigenous Rat of the Andaman Islands. Length about 8 in.; tail the same; ears much as in *M. DECUMANUS*. The fur a shade darker on the back than in that species, paler on the sides, and dull white below; the long piles at once distinguished by their flattened spinous character, which is also slightly the case in *M. RATTUS*, though much less conspicuously than in the present species. It would appear to be a burrower in the ground.

There are certain Indian Rats with the tail longer than the head and body, of arboreal habits, building nests in the branches of trees, never burrowing in the ground, and when they enter houses, (the commonest Bengal species (*M. RUFESCENS*) at least,) very commonly hide or attempt to hide during the day, in the *jilmils* or venetian blinds of apartments. The largest of these I have termed,—

*M. NEMORALIS*, Blyth, *J. A. S.*, XX. 168. This resembles the next, except in being considerably larger, much less rufescent above, and the under parts are merely paler or dull greyish brown, occasionally somewhat albescent. Length about  $8\frac{1}{2}$  in., tail  $9\frac{1}{2}$  in., hind-foot  $1\frac{1}{2}$  in. Inhabits Lower Bengal and also Ceylon.

*MUS RUFESCENS*, Gray, *M. N. H.*, *N. S.*, I. (1837), p. 585, apud Gray, though the description does not apply, and the tail is stated to be shorter than the head and body, whereas the reverse is the case.†

\* *Proc. Lin. Soc.*, Feb. 6th, 1862, p. 66: also *Zoologist*, p. 7983.

† "*M. RUFESCENS*, Gray. House Rat [!]. Fur pale brown; beneath, yellowish-grey. Under fur lead coloured, with numerous slender brown bristles, marked with a deep central channel, ending in a black hair-point; of the chin and under sides, softer, with whitish slender bristles. Tail nearly as long as the body [!], with rather small square scales, and very short hairs. Feet brown; claws white, covered with white hairs. Length of the body and head  $6\frac{1}{2}$  in.; tail  $5\frac{3}{4}$  in. [!], hind-foot  $1\frac{1}{4}$  in.; to base of thumb  $7\frac{1}{2}$  lines. Inhabits India."

It is utterly impossible to recognise the species from the foregoing description. On the same occasion Dr. Gray described—

"*M. ASIATICUS*, Gray. Pale brown blackish, varied. Ears large, nakedish. Checks, chin and beneath, greyish. Whiskers elongate, black. Tail as long as the body and head, with short adpressed black hairs, longer and more abundant near the tip. Cutting teeth smooth, and yellow in front. Thumb of fore-feet quite rudimentary, slightly clawed. Sole of hind-feet bald to the heel, with six tubercles; outer hinder largest. Heel narrow, one-third the length of the foot.



*M. flavescens* et *rufus*, Elliot; *M. arboreus*, B. Ham., Horsfield's Catalogue, and figured by this name in one of B. Hamilton's unpublished coloured drawings; (vide *J. A. S.*, XX. 168); *M. montanus*, *Kandianus*, et *tetragonurus*, Kelaart *J. A. S.*, XX. 169, 185. In general about 7 in. long, with tail 8 to  $8\frac{1}{2}$  in. Colour rufescent, brown above, white or yellowish white beneath, mostly abruptly separated from the hue above, and rarely gradually blending. Inhabits perhaps all India, with Ceylon, also China,\* and as Mr. Hodgson could scarcely but have met with it in the valley of Nepal, I take the following also to refer to it.

*Mus Caudator*, Hodgson; described in Horsfield's Catalogue of the Mammalia in the E. I. Museum, p. 144. "Above, chestnut-brown with a rufous shade, more clear and passing into reddish on the rump; underneath from the chin to the vent, with interior of the thighs, white, with a very slight yellowish shade. Muzzle rather sharp, ears proportionally long. Body and head,  $5\frac{3}{4}$  in. long; tail, in the prepared specimen, 6 in." (A young individual?) "Tail exceeding the body in length," Hodgson, *Ann. Mag. N. H.*, 2nd series, III. (1849) p. 203.

The *MUS PALMARUM*, Scherzer, from the Nicobar islands, probably belongs to this group.

*M. CINNAMOMEUS*, Blyth, *J. A. S.*, XXVIII. 294. "Like *M. flavescens*, but smaller, with proportionally longer tail and softer fur, of a fine bright cinnamon colour, with inconspicuous black tips, the under-parts white, which is abruptly divided from the cinnamon hue above. Length of head and body about 6 in., the tail  $7\frac{3}{4}$  in., and

The ball of the outer toes rather less than half the distance from the front of the foot. Inhabits India." Dimensions not stated.

In the *Brit. Mus. Cat.* p. 109, specimens are recorded from Mexico and Bahia! Another is stated to have been received from India, on which the description was founded.

Dr. Kelaart gives a *MUS ASIATICUS*, Gray, with a note of doubt. "Head and body (of a full grown *enciente* female) 6 in.; tail  $5\frac{1}{2}$  in. Fur soft; above, pale brown mixed with black; sides, ashy-grey. Beneath, pure white, but not so defined as in *MUS RUFESCENS* (*flavescens*, Elliot); tail rather thin, shorter than the head and body. Ears large, slightly villous. Limbs slender. *Geographical distribution*, India, Ceylon."

In Dr. Kelaart's *Prodromus Faunæ Zeylanicæ* we have *Mus flavescens*, Elliot (syn. *M. rufescens*, Gray, and *M. rufus*, Elliot), with var. *rufo flavescens* (syn. *M. tetragonurus*, Kelaart); also var. *Kandianus* (syn. *M. Kandianus*, Kelaart); and *M. nemoralis*, Blyth (erroneously described, syn. *M. arboreus*? apud Kelaart). Specimens of all these were received in the Society's Museum from Dr. Kelaart, and may be positively referred to *M. RUFESCENS*, Gray, (apud Gray). It is therefore useless to quote his descriptions; but he also sent the true *M. NEMORALIS*, nobis, of which I take his "small house Rat of Trincomali" to be a half grown example.

\* We have a Chinese specimen, presented by R. Swinhoc, Esq.

hindfoot  $1\frac{1}{4}$  in." Two specimens received from the late Major Berdmore, of Schwe Gyen, on the Sitang river, which separates Pegu from Martaban. The upper parts of this species are as brightly coloured as in the British Dormouse (*MYOXUS AVELLENARIUS*), or scarcely less so.

*MUS NIVIVENTER*, Hodgson, *J. A. S.*, V. 234; *Ann. Mag. N. H.*, XV. (1845), p. 267, a house Rat. Proportions and characters of the last [*rattoides*], but tail rather shorter, and long piles of the pelage rarer. Size less. Above, blackish brown, shaded with rufous; below, entirely pure white, tail and all. Snout to vent  $5\frac{1}{4}$  in.; tail 6 in.; weight 4 to 5 oz., of rare occurrence in Nepal.\* Col. Tytler brought two specimens in spirit from Masuri, which I have considered to be this, and have noticed in *J. A. S.*, XXVIII. 295, as "a well marked species, rather larger than as originally described." A male measuring 6 in. long, with tail 7 in., and hind-foot nearly  $1\frac{1}{2}$  in., female even larger or 7 in. long, with tail  $7\frac{1}{2}$  in. Two specimens, from Landour, I have supposed to be of this race; but they are very like *M. RUFESCENS*, only with coarser and sub-spinous fur of duller colouring, and the minute setæ on the tail are dusky-brown.†

*MUS ROBUSTULUS*, nobis, *J. A. S.*, XXVIII. 294; also *M. RUFESCENS*, Gray (?), *var? ibid.*; and (I suspect) *M. RUFESCENS*, auct. of Burma and Penang, auctorum: *M. rattus*, brown *var*, apud *nos*, *J. A. S.*, XVII. 559 (?) perhaps also *M. Berdmorei*, nobis, *J. A. S.*, XX. 173. The common Rat of Lower Pegu and the Tenasserim provinces, taken about houses at night, but I think not a burrower. The description of *M. ROBUSTULUS* was taken from a particularly fine specimen preserved in spirit; much like *M. RUFESCENS*, but the upper parts are darker and less rufescent, and the tail about equals the head and body in length. One example procured in the vicinity of Calcutta, or perhaps this should rather be regarded as a variety of *M. RUFESCENS*.

\* In *J. A. S.* V. 234, it is thus described "Above, saturate black-brown; below, pure white, tail considerably longer than the body, and paled on the inferior surface."

† "Dark brown; the cutting teeth very narrow and slender; hind-feet slender, 1 in. Length of head and body,  $6\frac{1}{2}$  in." (Gray, in *Cat.* of Mr. Hodgson's specimens). Probably, therefore, not the same as the above; the fore teeth of which are of the usual breadth, and the hind-foot measures  $1\frac{3}{8}$  in. (.....? Specimens.)

*M. Berdmorei* is thus described—"Length about a foot, of which the tail is not quite half. Ears posteriorly  $\frac{3}{8}$  in. Hind-foot  $1\frac{3}{8}$  in. Fur shortish, even coarse and hispid, but not spinous, of one quality, with no long hairs intermixed. Its colour grizzled grey, [dull brown] above, unmixed with rufous, below and on the feet, white. Rodentia tusks white. Tail rather more copiously clad than usual with long hairs." (E. B.) We have three specimens from Mergui, neither of which accords well with either of the others. One bad skin is decidedly *M. ROBUSTULUS*; that of *M. Berdmorei* has peculiarly hispid fur; and the third (entire in spirit) has dark upper-parts and very white lower-parts, also smaller front-teeth.

*MUS NITIDUS*, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 267. "Distinguished for its smooth coat or pelage, wherein the long hairy piles are almost wanting. It is a house Rat, like *M. NIVIVENTER*, but much rarer, and frequents the mountains rather than the valleys. Structure nearest to *rattoides*, and colour very similar to that or dusky brown above and dusky-hoary below. Long piles  $\frac{1}{16}$  in. long; basally horny, apically black. Short piles cinereous below, with pale rufous tips. Snout to vent  $6\frac{1}{2}$  in.; tail  $7\frac{1}{4}$  in.; head  $1\frac{1}{16}$  in.; ears  $\frac{3}{4}$  in.; palma (with nail)  $\frac{1}{16}$  in.; weight  $3\frac{1}{2}$  oz." We have several specimens of what I take to be this Rat from Darjiling: they are especially distinguished by the fineness and softness of the fur. One specimen only of eight, from Darjiling, which I refer to this species has the lower-parts pure white, abruptly defined; but it is obviously of the same species as the other, and one supposed *MUS RUFESCENS* from China (*J. A. S.*), seems really not to differ, except in being not full grown.

*MUS HORIETES*, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 268. "Dwells in houses and out-houses. A small land species with fine pelage, and no peculiarity of physiognomy or proportion. Tail longer than the animal. Colour above, sordid brown; below, sordid white. Snout to rump 4 in.; tail  $4\frac{1}{4}$ ; head  $1\frac{1}{4}$ ; ears  $\frac{7}{16}$ ; palma  $\frac{1}{2}$ ; planta  $1\frac{1}{8}$ ." Hodgson.

*MUS FULVESCENS*, Gray, Catalogue of Mr. Hodgson's specimens, p. 18. "Fur pale fulvous, hair very soft, lead coloured, with bright yellow tips, and interspersed slender black bristles; throat, belly, and beneath, pure white; tail elongate, nearly bald; cutting teeth nar-

row; skull about 1 in., 2 lin.; hind-feet about 1 in." (Gray). No other measurements given! "Nepal."

*MUS ÆQUICAUDALIS*, Hodgson, described in Horsfield's Catalogue, p. 144. "Pure dark brown above, with a very slight cast of rufescent in a certain aspect; underneath, from the chin to the vent with interior of the thighs, yellowish-white. Ears nearly an inch long; head proportionally long. Dimensions from the snout to the root of the tail,  $8\frac{1}{2}$  in.; tail in the living animal, equal in length to the body; head  $2\frac{1}{2}$  in." (Hodgson.)

Of all of the foregoing species or races described by Mr. Hodgson, carefully prepared specimens are most acceptable; and residents in the hill-stations should be able to identify at least some of them, and so help to elucidate such distinctions as may really exist among them.

*MUS CONCOLOR*, nobis, *J. A. S.*, XXVIII. 295 (the young); and *M.* (unnamed), p. 294 *ibid.*, (the adult). Common small thatch Rat of Pegu and Tenasserim provinces. This species conducts from the long-tailed Arboreal Rats to the ordinary house Mice. Certain Arboreal Mice that are diminutives of the former constitute the *VANDELEURIA* of Gray *Ann. Mag. N. H.*, X. (1842), p. 265: such are—

*MUS OLERACEUS*, Bennett, *P. Z. S.* 1832, p. 121: *M. oleraceus et (olim) longicaudatus*, Elliot; *M. dumeticola*, Hodgson, and the young (?), *M. povensis*, H., *Ann. Mag. N. H.*, XV. (1845) 268-9, also *M. dumecolus*, Hodgson, (undescribed). Length about or nearly 6 in.; tail 4 to  $4\frac{1}{4}$  in.\* Of a bright pale chesnut hue; below, white. "Constructs its nest of oleraceous herbs in the fields." (Sykes). Specimens from Asám and from the Deyra Doon are absolutely similar to others from S. India; and as Hodgson's descriptions of a Nepalese Mouse also accord, I infer that his species differs in no respect. "Tenants woods and coppices." (Hodgson).

*MUS BADIUS*, Blyth, *J. A. S.*, XXVIII. 295. Like *M. OLERACEUS*, but the eye fully twice as large, and black whiskers; colour of the upper-parts a more rufous chesnut or cinnamon hue; of the lower-parts white, almost pure. Length of a female 3 in. to base of tail; the tail  $4\frac{2}{3}$  in.; and hind-foot  $\frac{5}{8}$  in. Received from Schwe Gyeu.†

\* A Deyra Doon example in spirit measured  $2\frac{2}{3}$  in., with tail  $4\frac{1}{2}$  in.

† We have a small rufous Mouse in spirit, which I suspect is from Kashmir, or otherwise trans-Himalayan. I cannot distinguish it from *M. MINUTUS*, Pallas (vide *Messorius*, White, &c.), also in spirit from England.



MUS GLIROIDES, Blyth, *J. A. S.* XXIV. 721. "This has very much the aspect of the British Dormouse (*MYOXUS AVELLANARIUS*); but what little remains of the tail of the only specimen sent is nude, and the colouring is much less bright, though inclining to the same hue. It would seem to represent a very distinct division of the genus *MUS*; but the specimen is evidently young, and more and better examples are needed for a satisfactory examination. Fur exceedingly dense and fine, nearly  $\frac{3}{8}$  in., long upon the back, and of a light brown colour tinged with fawn externally, the piles dusky-ash for the basal two-thirds or more; lower parts white, very faintly tinged with fawn; the white purest about the lips and chin: whiskers long, copious and fine (like those of *MYOXUS AVELLANARIUS*): feet large and clad scantily with white hairs; but a distinct dark brown mark upon each hind-foot, reaching almost to the division of the toes: ears rather small, ovoid and naked. Length of head and body 2 in.; tail — ?; ears posteriorly  $\frac{1}{16}$  in.; and tarsi  $\frac{5}{8}$  in." From Cherra Punji.

MUS PEGUENSIS, Blyth, *J. A. S.* XXVIII. 295. "A field Mouse with tail longer than the head and body, well clad with hairs that become longer to the end. Length to base of tail  $3\frac{1}{8}$  in.; of tail  $3\frac{7}{8}$  in.; ear-conch  $\frac{1}{2}$  in.; and hind-foot  $\frac{3}{4}$  in. These are the measurements of a female in spirit. A stuffed male has the tail (vertebræ)  $4\frac{1}{2}$  in. Fur very full and dense, pale fulvescent olive-brown on the upper-parts, slightly yellowish-white below: whiskers remarkably long." Not much unlike *M. SYLVATICUS* in appearance, but the tail longer and very conspicuously hairy towards the end, indeed more so throughout than in any other mouse I know of, as especially seen when held up to the light; but it does not appear to be specially akin to the *HAPALOMYS LONGICAUDATUS*, nobis, *J. A. S.* XXVIII. 296. Both were received from Schwe Gyen, on the Sitang river.

The series next following consists chiefly or wholly of house Mice.

MUS URBANUS, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 269: *M. dubius* (?) H., *ibid.* p. 268: *M. musculus* apud Elliot et Kelaart: *M. mani*, Gray (undescribed). "The common house Mouse of India generally, with Ceylon. Species usually found in the city of Kat-

Of the diminutive species from China noticed in *J. A. S.* XXIX. 90, the specimen has been lost or mislaid by one of our taxidermists, to whom I gave the skin to be mounted.



mandoo: allied to *dubius* in its proportions and colours, and possibly *dubius* may be the immature. Above, embrowned ruddy-luteous; below, luteous, more or less rufescent. Feet paler. Snout to rump  $2\frac{3}{4}$  in.; tail  $3\frac{3}{4}$  in.; head  $1\frac{1}{16}$  in.; ears  $\frac{6}{16}$  in.; palma  $\frac{3}{8}$  in.; planta  $\frac{3}{8}$  in.; weight  $\frac{1}{2}$  oz." (Hodgson).\* "On comparing fine specimens of the common English mouse in spirit with equally fine examples of the Indian house mouse, it is seen that *M. MUSCULUS* has conspicuously larger ears, much smaller eyes, broader paws, and the tail is one-fourth shorter, measuring 3 in., in *MUSCULUS* and 4 in. in *URBANUS*. The fur again is of very different texture," *J. A. S.* XXVIII. 296. This animal has been received from Port Blair, where doubtless recently introduced.

*MUS HOMOURUS*, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 268. *M. Nipalensis*, H., *J. A. S.* X. 915, (undescribed). "The common house mouse of the Himālaya hill-stations, from the Panjāb to Darjiling." "Distinguished by a tail equal to the animal, being usually quite equal, but sometimes rather less. Coloured like *DECUMANUS* but purer, or rufescent brown above, and rufescent white below. Hands and feet fleshy white. Snout to rump  $3\frac{1}{2}$  in.; tail  $3\frac{1}{2}$  in.; head  $1\frac{1}{16}$  in.; ears  $\frac{9}{16}$  in.; palma —?; planta —?; weight  $\frac{3}{4}$  oz. It has eight teats only in the females? The other Mice have ten and the Rats twelve." (Hodgson). "As compared with the European *M. MUSCULUS*, the fur is much more Gerbille-like in character, the piles less dense and sinuous." (*J. A. S.* XXVIII. 295.)

*MUS CRASSIPES*, Blyth, *J. A. S.* XXVIII. 295. "Like the preceding, but with the tail rather longer than the head and body. Length  $2\frac{3}{4}$  in., tail  $3\frac{1}{4}$  in.; hind-foot  $\frac{3}{4}$  in." "The feet particularly large, and, like the tail, well furnished with coarse short setæ. From Māswei." Described from a specimen in spirit belonging to Col. Tytler.

*MUS TYTLERI*, Blyth, *J. A. S.* XXVIII. 296. "Length  $2\frac{3}{4}$  in.; tail the same (having about 24 vertebræ). Fur unusually long and full, of a pale sandy mouse colour above, isabelline below, and pale on the well clad limbs and also on the tail laterally and underneath. Whiskers exceedingly fine in texture, and of a whitish colour. Male

\* *M. dubius*, H., "a house Mouse, but also found in out-houses and gardens rarely allied to *dumeticola* [oleraceus] by its long tail. Above, dusky brown, touched with fawn; below, sordid fawn. Snout to rump  $2\frac{1}{4}$  in.; tail 4 in.; head  $\frac{7}{8}$  in.; ear  $\frac{3}{8}$  in.; weight 2 oz." (Hodgson.)

from Deyra Doon," also described from a specimen in spirit belonging to Col. Tytler.

*MUS BACTRIANUS*, Blyth, *J. A. S.* XV. 140. "Presents a very close approximation to *M. MUSCULUS* in size, proportions and structure, inclusive of the conformation of the skull; but the fur is much denser and longer, and its colouring absolutely resembles that of a pale specimen of *GERBILLUS INDICUS*, except that there is no whitish about the eyes, nor is the crown of a deeper hue, and the tail is thinly clad with short pale hairs to the end.\* \* \* The entire under parts and feet are white; and the upper-parts light isabelline, with dusky extreme tips to the hairs, and their basal two-thirds deep ashy." (B.) :—The common house Mouse of Kandahar; but the house Rat is, I believe, unknown there: at least so all my informants agreed in stating, and I certainly never saw one, although for two years I was in charge of extensive grain godowns, which would naturally have attracted them had any existed." (Hutton.) Syn? *M. gerbillinus*, nobis, *J. A. S.* XXII. 410, and *M. Theobaldi*, nobis, *J. A. S.* XXII. 583.

*M. gerbillinus*. Entire length of male 5 in., of which the tail is  $2\frac{7}{8}$  in. Hind-foot  $\frac{3}{4}$  in., ear-conch barely  $\frac{1}{2}$  in. Female rather smaller. Fur of mean length, of a sandy-brown colour on the upper-parts, white below and on the limbs, which latter have a faint tinge of the colour of the back. About twenty-five caudal vertebræ. Tail thinly clad with minute setæ." From Pind Dadun Khan.

*M. Theobaldi*. "Like *M. gerbillinus* [*BACTRIANUS*], but larger, with comparatively shorter tail and larger feet. Dimensions of an adult female—Length of head and body  $2\frac{7}{8}$  in.; tail  $2\frac{5}{8}$  in.; ears  $\frac{1}{2}$  in.; tarsæ and toes  $1\frac{1}{8}$  in." From Kashmir.

*M. NITIDULUS*, Blyth, *J. A. S.* XXVIII. 294. "A house mouse apparently, with tail equal to the head and body, and uniformly furnished with minute setæ to the end; ears large and ample. Total length  $6\frac{1}{2}$  in.; hind-feet a little exceeding  $\frac{3}{4}$  in.; and ears (posteriorly)  $\frac{9}{16}$  in. Colour nearly that of *M. DECUMANUS*, with the under parts subdued white tolerably well defined. Of the same subgroup as *M. MUSCULUS*\* and *M. URBANUS*," but with the front-teeth conspicuously larger. Received from Schwe Gyen, on the Sitang river.

\* Perhaps *M. MUSCULUS* (?), L., apud Cantor, from Penang; *J. A. S.* XV. 254. "In colours, this slightly differs from the European Mouse, the upper parts

MUS CUNICULARIS, Blyth, *J. A. S.* XXIV. 721. "A small field (?) mouse remarkable for its ample ears, and tail shorter than the head and body. Length of head and body  $2\frac{1}{2}$  in.; of tail  $2\frac{1}{8}$  in.; ears posteriorly  $\frac{1}{2}$  in.; and hind-foot  $1\frac{1}{8}$  in. Colour of a wild Rabbit (*LEPUS CUNICULUS*); above, below white; and the feet with brownish hairs above, but with white hairs upon the toes: tail conspicuously ringed, the setæ minute and inconspicuous." From Cherra Punji.

MUS DARJEELINGENSIS, Hodgson, described in Horsfield's Catalogue. "Above dusky brown with a slight chesnut reflection; underneath pale yellowish white. Snout to vent 3 in.; ears long; tail  $2\frac{1}{2}$  in. Proportions of body, tail and extremities, comparatively slender." (Horsfield).

MUS ERYTHROTIS, Blyth, *J. A. S.* XXIV. 721. "Another and very different form of mouse from [*M. GLIROIDES*], and equally from the common house mouse. Length of head and body  $2\frac{1}{4}$  in.; tail  $2\frac{3}{8}$  in.; and consisting of about 26 vertebræ: ears small and hairy,  $\frac{1}{8}$  in., long externally: hind-foot and claws  $1\frac{1}{8}$  in. Fur long and very dense; of a rich dark brown colour, grizzled, and brightly tinged with rufous or rufo-ferruginous towards the tail and upon the ears conspicuously: lower parts albescent, tinged with fawn: feet with brown hairs upon their upper surface; and the tail considerably hirsute. From Cherra Punji.

The ordinary field Mice of India have the tail shorter than the head and body, the fur not spinous, and white or pale lower parts abruptly separated from the colour of the back. Such are—

MUS INFRA LINEATUS, Elliot, *M. S.* *M. Ellioti*, Gray, (undescribed, nec *Golunda Ellioti*, Gray,) *Br. Mus. Catal. Mamm.*, p. 110. The largest of the group. Length about 5 inches; and tail  $4\frac{1}{2}$  in.; hind-foot  $1\frac{1}{8}$  in. Light fulvous brown above, white below, with a mark on the chest of the colour of the upper parts. From S. India.

being a mixture of shining grey and tawny. The separate hairs are leaden grey at the base, then tawny with black apex; some are longer and uniformly dark brown. Beneath, pale ash. The ears are larger, more than half the length of the head, with very short hairs, rounded, blackish. Toes, palms, and soles, whitish. Tail slender dark grey, with very short adpressed brown hairs. Length of head and body  $2\frac{3}{8}$  in.; tail  $2\frac{1}{2}$  in." (Cantor).

I had missed our solitary specimens of *M. NITIDULUS* and of *M. GLIROIDES*; when I chanced to find the former in a bottle containing Kandyan examples of *M. RUFESCENS*! No doubt some one had broken the bottle, and said nothing about it; a trick not wholly new to my experience in the Society's Museum.

MUS CERVICOLOR, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 268; *M. albidiventris*, Blyth, *J. A. S.* XXI. 351. "Distinguished by its short tail. Above dull fawn, below sordid white. Lining of ears and extremities pale. Snout to rump  $3\frac{1}{2}$  in.; tail  $2\frac{7}{8}$  in.; head 1 in.; ears  $\frac{9}{16}$  in.; weight  $\frac{3}{4}$  oz. Females less and having ten teats," (Hodgson). Length of a large male  $3\frac{1}{4}$  in.; of which the tail is  $2\frac{3}{4}$  in.; tarsi to tip of claws  $\frac{1}{16}$  in.; ear (from anterior base),  $\frac{9}{16}$  in. Nepal; Bengal (vicinity of Caleutta); Malabar.

MUS FULVIDIVENTRIS, Blyth, *J. A. S.* XXI. 351: *M. cervicolor*?, Hodgson, apud Kelaart, *Prod. Faunæ Zeyl.*; p. 64. "Length about  $2\frac{3}{4}$  in.; tail (vertebræ)  $2\frac{1}{2}$  in.; tarsi to tip of claws  $\frac{5}{8}$  in. Colour of *M. SYLVATICUS* above the fur shorter and less fine (as in its various Indian affines), lower parts rufescent or isabelline, or they may be described as a pale weak ferruginous. Twenty caudal vertebræ distinguishable, with  $\frac{1}{4}$  in. additional of tail-tip." (E. B.) From Ceylon. "Found in houses in Trincomali." (Kelaart).

MUS STROPHIATUS, Hodgson, *Ann. Mag. N. H.*, XV. (1845), p. 268. "A field mouse closely allied to *M. CERVICOLOR*, but seemingly distinct. Bright fawn above, pure white below; a cross or gorget on the breast. Snout to vent  $3\frac{1}{8}$  in.; tail  $2\frac{7}{16}$ ; head less 1; ears  $\frac{9}{16}$  in.; weight  $\frac{1}{2}$  oz." (Hodgson.)

MUS TERRICOLOR, Blyth, *J. A. S.* XX. 172. "This much resembles *M. LEPIDUS*, Elliot, in form and colour, but the face is very much shorter, and the fur short, soft, and not spinous in the least degree. Its colour varies, however, according to the soil; those of the alluvium of the Ganges being darker than specimens from the ferruginous soil to the westward. All have the under-parts white, abruptly separated from the hue of the upper-parts, and in the various affined species. Length  $2\frac{1}{2}$  in.; of tail  $2\frac{1}{8}$ ; ears  $\frac{1}{4}$ ; hind-foot  $\frac{9}{16}$  in. Inhabits gardens and is very numerous in the open fields; together with *GERBILLUS INDICUS* and *MUS INDICUS*." (E. B.) The most common field and garden Mouse in Lower Bengal. I found it very abundant in the Santál districts westward of Midnapore.

Allied to the foregoing are certain spine-clad field Mice which have been designated *LEGGADA* by Dr. Gray, (*M. N. H.*, I., 1837, p. 586).

L. SPINULOSA, Blyth, *J. A. S.* XXIII. 734. "Nearly affined to *M. PLATYTHRIX*, Sykes, but of a dark dusky colour above, with ful-

vous tips to the softer fur: below and all the feet [dull] whitish. Upper rodential tusks orange, the lower white. Whiskers long and fine, the posterior and longer of them black for the basal half or more, the rest white. Length of adult male (in spirit)  $3\frac{3}{4}$  in.; tail 3 in. (about, the extreme tip wanting in the specimen); planta  $\frac{7}{8}$  in." (E. B.) From the Punjab, and specimens since received from S. Malabar, (*J. A. S.* XXIX. 3,) are quite similar, unless rather larger, and there is little difference in the colour of the upper and lower tusks.

L. JERDONI, Bl., *n. s.* Bright dark ferruginous above, pure white below; some fine long black tips intermingled among the spines of the back: limbs marked with blackish externally; the feet white. Length about 4 in.; tail  $3\frac{1}{2}$  in.; hind-foot  $\frac{7}{8}$  in. Procured in Sikhim by Dr. Jerdon.

L. PLATYTHRIX; *Mus platythrix*, Bennett, *P. Z. S.* 1832, p. 121; *M. saxicola*, Elliot, *MSS.* Light sandy brown, white beneath; the flat spines less developed than in the two preceding species. Length  $3\frac{1}{2}$  in.; tail  $2\frac{1}{2}$  in.; hind-foot  $\frac{3}{4}$  in.; S. India. *Vide* Elliot in *Madr. Journ. Lit. Sc.* X. (1839), p. 215.

L. LEPIDA; *Mus lepidus* Elliot, *Madr. Journ. L. Sc.* X. 216: *L. booduga*, Gray, *M. N. H.*, I. (1837), p. 586. Similar to the last but smaller, and but weakly spinous. "The dimensions of an old male were—length of head and body  $2\frac{9}{10}$  in.; tail  $2\frac{7}{10}$  in.; hind-foot  $\frac{6}{10}$  in." (Elliot). *Vide loc. cit.* S. India. "Inhabits India, Bombay. They live in pairs in the black soil, making little burrows, in which they produce two or three young." (Gray.) The colour of this small mouse would rather indicate that its abode was in a pale sandy soil. Mr. Elliot writes—"Lives generally in pairs in the red soil," &c.

Another type has been designated GOLUNDA by Dr. Gray, in *M. N. H.*, I. (1837), p. 586. "The grinders, when perfect, low, with a broad flat crown; the cross-ridges of the crown of the upper grinders divided into three distinct slightly raised tubercles. Rat-like Mus."

G. ELLIOTI, Gray, *M. N. H.* 2nd series, I. (1837), p. 586, (nec *Mus Ellioti*, Gray, *Br. Mus. Cat.*). "Fur pale brown, with minute, very slender, hair-pointed black tips. Chin, throat, and beneath, whitish. Under fur paler. Teeth yellow; upper cutting teeth groov-



ed in front. Ears covered with short hair. Inhabits India, Bombay." No dimensions given!

SYN. *Mus hirsutus*, Elliot; the *Gulandi* of the Canarese. "About the size of *M. lanuginosus*, or a little larger,—but differs in living entirely above ground, in a habitation constructed of grass and leaves, generally in the root of a bush at no great height from the ground, often indeed touching the surface. The head is longer than that of the *Mettade*, but the muzzle is blunt, rounded, and more obtuse, and covered with rough hair. The face and cheeks are also rougher than those of other Rats; the ears round and villose, the eyes moderate; the whiskers long and very fine. The colour is an olive-brown above, mixed with fulvous; beneath yellowish-tawny; sometimes paler, or light yellowish-grey.

"A male *Golunda* measured—length of body  $6\frac{1}{2}$ , of tail  $4\frac{3}{10}$ ; of head  $1\frac{1}{10}$ ; of ear  $\frac{6}{10}$ , weight nearly 3 oz."

For habits, *vide* Elliot, *loc. cit.*

A number of specimens in spirit presented to the Society's Museum by Mr. Elliot are considerably smaller, though appearing to be adult, and a female is sent with its born young; these accord, however, precisely with the 'Coffee Rat' of Ceylon, as described by the late Dr. Kelaart. He presented the Society with a specimen which is unquestionably identical in species with Mr. Elliot's specimens sent by the latter to the Society's Museum.

G. COFFÆUS, *Mus coffæus*, Kelaart, *Prodromus* (1852), p. 67. "Head and body  $4\frac{1}{2}$  in.; tail 4 in. Fur thick, stiff; above, fulvous-brown, mixed with black; beneath, tawny-grey. Hairs of upper-parts, flattened, ashy-grey, tipped yellow, with some thinner and longer ones, also tipped yellow, with subterminal black band. Under fur soft, and of a light lead-colour. Face and cheeks rough. Ears moderate, subovate, villous; yellow-ferruginous. Tail round, tapering, scaly and villous; its upper surface dark brown—lower surface yellowish. Cutting teeth yellow. Upper ones grooved as in GERBILLUS.

"This is the Rat which [in Ceylon] is so destructive to coffee-trees. Whole plantations are sometimes deprived of buds and blossoms by these Rats. They are found in all the higher parts of the Kandian provinces. The attention of Europeans has only been drawn to them since coffee-planting commenced in the island. They appear to be migratory; and are not always seen in coffee estates: when they do visit the cultivated parts, their numbers are so great, that in one day more than a thousand have been known to be killed on one estate. In clearing forests, the nests of these Rats are met

with under the roots of trees. We have not been so fortunate as to see many fresh specimens; only one was brought to us from Kaduganava: a premium is set by some coffee-planters on the heads of these rodents. The Malabar coolies are very fond of eating them roasted, or fried in oil."

G. MILTADA, Gray, *M. N. H.*, 2nd series, I. (1837), p. 586. "Length of body and head  $4\frac{1}{2}$  in. Fur very soft, mouse-coloured varied with black; chin, and beneath, whitish. Under-fur lead-coloured, with very numerous soft brown hairs having long black tips; of the belly white, with brownish tips. Ears large, hairy. Whiskers very slender, long. Tail shorter than the body, scaly, covered with short adpressed black hairs, hiding the scales. Feet pale; claws white. Inhabits Bombay. Lives in cracks in the black soil, in pairs; and are often crushed, when the rain, or cultivation, obliterates the cracks."

Syn. *Mus lanuginosus*, Elliot, *Madr. Journ. Lit. Sc.* X. (1839), p. 212. "*Mettade* of the Waddurs. The name adopted to designate this species is taken from the word *Mettade*, meaning soft, in allusion to its fur, which is fine and soft, *mettanu* meaning soft in Telegu. It is about half the size of *M. indicus*, which it somewhat resembles. The head is short, but the muzzle, instead of being square and truncate is sharp; the ears are larger in proportion and more ovate. The general form is not so stout. The tail is shorter than the body. The colour above is reddish-brown, with a mixture of fawn; lighter beneath, close and soft, with a few longer hairs projecting. A large adult male measured—length of body  $5\frac{6}{10}$  in.; of tail  $4\frac{3}{10}$ ; total  $9\frac{9}{10}$ ; of head  $1\frac{4}{10}$ ; of ear  $\frac{5}{10}$ . Weight  $2\frac{1}{2}$  oz."

For description of habits, *vide* Elliot, *loc. cit.* I have not yet seen this species.

G. NEWERA, Kelaart, *Ann. M. N. H.*, 2nd series, VIII. (1851), p. 339. Length of body and head  $3\frac{1}{4}$  in.; tail  $2\frac{1}{2}$  in. Fur soft, yellowish-brown varied with black; chin and beneath yellowish-grey; under-fur dark lead colour; soft long hairs on the upper parts of the head and body, with longer black-tipped hairs having a subterninal yellowish band; fur of belly dark lead-colour, tipped with yellowish-grey; ears large, hairy on both sides, of a light rusty or ashy colour; whiskers slender, moderately long, some greyish, others blackish; tail shorter than the body, tapering to a point, scaly; upper surface of a black colour and covered with short semi-adpressed black hair; lower surface yellow or ashy colour, covered with short hair of the same yellow colour; feet having dark brown claws, purplish, four toes


to the fore-feet, with a clawless rudimentary thumb [as in all *muridæ*?] \* \* \* Incisors yellow, the superior grooved in the centre; molars flat, deeply 3-lobed, the tubercles rising in three distinct lines, middle larger than those of the sides, and the front one extending beyond the other lobes.

“This Rat is found in pairs in the black soil of Newera Ellia, and is a great destroyer of peas and potatoes. In the Ouva district, we found another soil Rat, smaller than the above, and of a pale ashy colour, which at the time we referred to *L. boodaga* of Gray, but having since lost the specimen preserved in spirit, we are not able to give a description of it. That it was very different from every other Rat here described [in *Prodromus*], we have no doubt.”

Genus HAPALOMYS, Blyth, *J. A. S.* XXVIII. 296.

H. LONGICAUDATUS, Bl., *loc. cit.* Received from Schwe Gyen, on the Sitang river.

The reader has at length before him, without need of further research in books (so far as I can discover), an epitome of the long and perplexing series of Indian *Muridæ*, so far as the published descriptions of them can help him to identify any species that may fall under observation. In any part of India and the neighbouring countries, he might render useful service by collecting an adequate series of examples of the species procurable in the vicinity, both carefully prepared skins for mounting, and some entire specimens in spirit. Wherever found, these animals are, in general, obtainable in any quantity, from certain classes of natives who eat them, (or at least those inhabiting the jungles or open country,) and who are familiar with their haunts and habits. With really good and properly preserved specimens from different parts, and in sufficient number, the real species would soon be discriminated from the factitious, as indeed is already the case with a good many of them; and the latter would soon fall into the rank of synonyms, as by degrees one after another became identified and understood. It may not be a particularly inviting group to study, in the opinion of many observers and collectors; but it needs to be assiduously ‘wrought out;’ and the difficulty of reconciling the synonyms will be considerably diminished now that all the very numerous names and descriptions have been collated in one continuous grand series.



*Notes on the distribution of Indian terrestrial Gasteropoda considered with reference to its leaning on the origin of species.*—By W. THEOBALD, Jr.

“There are more things in Heaven and Earth, Horatio, than are dreamt of in your Philosophy.”

I am led to make the following remarks on a subject of considerable interest, by some suggestions contained in a Paper by my friends the Messrs. Blanford, which appeared in the fourth number of the Journal of the Asiatic Society for 1861. This paper is I trust but one of many which we may receive from the same writers, and it is by such contributions alone that we can hope to arrive at sound and comprehensive views of the distribution of the animals of which it treats, which, from their often limited range within the tropics, and the marked and peculiar forms they there exhibit, afford peculiar facilities for estimating the amount of support, derivable from their study, which they afford to the ingenious theory of Mr. Darwin of the origin of species. In several respects indeed the problem of the distribution of land mollusca and the origin of both their generic and specific types, is less encumbered with subsidiary considerations, requiring special allowance and elimination, than the same problem as regard any class of the vertebrata, and the land mollusca therefore afford not only a simpler, but also a more satisfactory field for testing how far a theory, which may find plausible justification and analogical support from admitted physiological modifications among the vertebrata, is applicable to and in accord with our knowledge of the invertebrate classes.

With this view therefore it will be well to sift carefully a suggestion made in the above quoted paper, which does not appear to me to stand on any firmer foundation than mere hypothesis.

After tabulating the distribution of the Terrestrial Gasteropoda of the Kolamully, Putchamully, Kalryenmully and Shevroy ranges of hills, the authors arrive at the conclusion that the whole area is occupied by one and the same fauna, (referring of course to the mollusca only,) with which conclusion I fully agree, but this uniformity is brought about not by the dispersion of the same species over the entire area, but by the occurrence of the same species on ranges of

hills isolated from one another by tracts, in which, from physical causes, shells are absent; hence it is argued, that at the period these colonists attained their present quarters, very different physical features and conditions must have obtained over the intervening area, to what now exist. In support of this they appeal to the geological history of the Peninsula, on which point I in no wise differ from them, but it seems to me that no necessity exists for appealing to any such agency to explain the distribution above mentioned, and that moreover it is utterly and beyond expression inadequate to promote the results attributed to it.

In a former paper I alluded to the existence of several distinct Indian Provinces of land mollusca, to which very few shells are common, and it is not less suggestive than singular that among the few shells common to two or more Indian Provinces, some of them trespass far beyond the geographical limits of India, even as far as Africa, Mauritius, &c. Now it is sought to be argued, that because some few shells such as *Helix Huttoni*, B., *H. Similaris* Fèr., *H. Castra* B. *Bulinus punctatus*, Anton, and some others, have a very wide range, that they must have migrated, inch by inch, over all the intervening space, or must have availed themselves of such means of conveyance as a conveniently submerged country, or the reverse of such a condition, as supposition demands, afforded.

A geologist certainly is not easily staggered by any considerations involving a mere question of time, but I confess that to me, more than ordinary difficulty seems to be involved in the supposition of the case of these living travellers, restlessly diffusing themselves as though urged on by the furies of Orestes, or propelled by the desire of possessing the fairer pastures of a far off land. The migratory instinct of birds certainly offers an instance of an irresistible and spontaneous impulse from within to seek other climes, but I am aware of no facts which would lead us to suppose that any similar instinct or stimulus is implanted in the invertebrate classes, which would ensure or conduce to their dispersion. In such cases too, as Mr. Darwin suggests, (*Origin of Species*, page 397,) the means of transport afforded by winds and waves, is quite independent of any voluntary effort on the part of the animal, who, for many a weary day or week, must have concentrated its energies to retaining hold of its straw or stick. The possibility of a small *Helix* being carried uninjured round the globe,



wedged in a cleft stick or cemented to a bough, I fully admit, but not if the animal was exposed to the moist sea air, not to say immersed in either fresh or salt-water, as such a condition would certainly provoke its dormant vitality and lead to its destruction; and it must be remembered, that the period when shells are most liable to be carried down by streams, is just the time when they are most active and unlikely to be hermetically fastened to their hot-weather roosting-places: the method of diffusion therefore of shells on floating wood, I must, though of course opinions will differ, regard as strained and improbable even as an exceptional case.

Equally difficult is it to realize the dispersion by the accidental method of the freshwater shells of India, enjoying as they do a far wider range than the terrestrial races, though they must be less fitted than any land shell for transmission across a submerged country. Birmah for example possesses its own peculiar *Uniones*, but many Indian freshwater shells (including *Unio ceruleus* and *U. marginalis*) range our Birmah also, though it will hardly be contended that these shells navigated the salt seas on sticks, or ploughed their way inchmeal over every water-shed between the Indus and Irawadi; neither is it easy to say, if such means were really subservient to the diffusion of the wide spread species, how the peculiar or local species which are the most numerous, did not come to extend their range in like manner. Indeed it seems to me an inevitable conclusion, if we admit the potency of accidental transmission to extend the range of a species, that no such thing as a local fauna, possessing a special facies and circumscribed limit, could exist, or at the most that such a limitation of species among the mollusca would be the exception and not the rule, which our knowledge of the distribution of Indian mollusca, (to confine myself to my topic,) emphatically disproves. With whatever theory we associate the fact, few will deny that all animals have a definite range in space, no less than in time, and which is not the less a reality, because it is capable of extension or mutation under the influence of physical conditions, just as the normal life of an animal may be prolonged or curtailed by the conditions by which it is surrounded; and as some genera enjoy a far larger range in time than others in the vista of the past, so some genera and species are far more widely spread as regards space than others, whose restricted areas are swallowed up as it were in the domain of their numerically inferior allies.

The widely diffused species are not individually so numerous as to favour the idea of their extended range being the result of a vivacious *debâcle* of individuals overflowing from the cradle of their species : indeed most of the more restricted species are fully as numerous or more so within their own area, than those whose area is one hundred times larger : we must, therefore, I think, reject the idea of their diffusion being either the result of accidental transmission, vagabond instincts, or numerical pressure of individuals. Some of the suggested methods indeed of explaining the subject, do not seem greatly to differ in kind or credibility from the nursery machinery of the blue bag and the parsley bed, with which crones are wont to satisfy the curiosity of troublesome juveniles, regarding the antecedents of the little stranger who is occasionally incorporated in the family circle. The whole question in fact of the distribution of animals hinges on the origin of species, anything throwing light on one, helping equally to elucidate the other, and here my own views differ from those of my friends, the Messrs. Blandford. If it can be established that all animals are descended from a single pair, whose descendants radiate from their own little Ararat and that the world was replenished with life from a point, then all the fine arguments that can be adduced against the feats of navigation and travel, performed by these tiny sailors under trying circumstances, fall to the ground before the plain deduction, that however the deed was accomplished, accomplished it has been ; but till the fact is established, or unless we shackle ourselves by an assumption, known facts seem to favour the idea of a plurality of archetypal pairs, and their sporadic distribution, (as the *ethnic centres* of the human races,) over the specific area, proportionately to its extent. Ample room would still be left under this supposition, for extensive migration of the animals themselves, and for the enlargement or contraction of their area, even to the entire change of its original site, under pressure of changed conditions and such surface revolutions as many species must have been subjected to. Such changes, however, of distribution must have ever constituted the exception, and are probably confined to a few, and those few widely spread species ; and to apply the argument in favour of all, that may be admissible with a few, appears rather opposed to, than supported by, the most liberal interpretation of facts. The inherent weak point in the theory of the distribution of species, is the same as the weakest point of the Ori-

gin of Species,—the unlimited application of facts which have but a limited bearing. It is as though any one should argue, that because a man may live to 20 years or 40 or 80, therefore he may live to 160. Migration of species as well as individual changes may take place, but to these there are limits not the less impassable, because not sharply defined. Many of our domestic animals are as artificial creations as our 8-day clock, but their variation from the focal stock, though considerable, and ill-defined in its limits, is subject to certain bounds; and I cannot see that from these known deviations, it is logical to argue unknown deviations, such as no sick man ever dreamed of: or that a bear, though the breeder might in time lengthen his nose or shorten his claws or fur, could ever suffer a sea change and cleave the deep like a whale, any more than he could scale the heavens like a cherub. The idea *may* be philosophical but it *is* absurd.

Those who reject the idea of original or archetypal pairs of all animals in favour of the theory of “natural selection,” must embrace the same views regarding the method of their distribution, as those who hold every animal to have radiated from Mt. Ararat, as lineal descent is the Ariadnean thread whereby they seek to solve the mystery of the “parsley bed,” but though this theory certainly shifts the difficulty a long way off, yet it by no means disposes altogether of the necessity of a primordial “*blue bag*” of some sort or another, as none of its adherents, that I am aware of, have advanced any refutation of the accepted aphorism.

“gigni

“E nihilo nihil, in nihilem nil posse reverti.”

It is clearly essential for those who support the natural selection theory, and regard species as merely pronounced or rigorous varieties springing from the same stock, to establish the efficacy of transport or migration, to bring about the distribution of all animals within their respective areas: hence the variety of means suggested for that end, most of which seem, to say the least of it, far fetched and improbable. Earth, ocean, and the winds of Heaven are taxed in turn to afford means of transport for widely diffused species; hence the interest attaching to a careful study of the distribution of the mollusca, as affording serious grounds for doubting some of the conclusions the above theory necessitates, and the light which it is likely to afford to future enquirers. But to return to the more immediate subject of remark:—the diffusion of terrestrial mollusca over their individual area

To account for the diffusion of the descendants of a single pair, two modes are usually suggested as adequate, viz., voluntary migration of individuals, and their fortuitous transport on floating logs or lesser vehicles over the watery waste. Now the spontaneous migration of animals can only be brought about by the operation of two causes,—a natural instinct such as regulates the movements of migratory birds, the operation of which we may safely dismiss from our present calculations, or the necessity for seeking more abundant supplies of food, or of avoiding unsuitable physical conditions. In the case, however, of the invertebrata we are considering, the second cause can have but little more effect than the first in stimulating their movements, as we know of no migratory hosts of snails, compelled by dearth of food to shift their quarters, or of any who adopt any other mode than torpidity to escape the prejudicial effects of either extreme heat or cold: representing therefore the results of migration as  $x$ , we may safely conclude that  $x = 0$ . There still remains the very varied, and as it is usually deemed, efficacious mode of accidental transport by winds and waves through the agency of floating wood and the like. Certainly a complete list of all the terrestrial shells which have trusted their lives to floating wood since the days of Adam, would, maugre its small size, prove a formidable difficulty for me to dispose of, and I am prepared to admit that many cases of dispersion by accidental agencies may have occurred, and to give the full weight to this cause, which I think it is fairly entitled to; but it is not to explain an occasional or exceptional case, that the power of floating wood is invoked, but to account for the general diffusion of individuals throughout the area of the species, and this, as I have before remarked, seems utterly disproved by great numerical preponderance of species enjoying very restricted areas, (most strikingly so among the operculata,) a few only overrunning the boundary of the province in which they occur, and of these which do so, some extend their range far beyond any strictly Indian Province. To illustrate this more forcibly, I give a tabular statement, exhibiting the distribution of the two most important families of terrestrial mollusks in India, viz., the Helicidæ and Cyclostomidæ; prefacing it with a few words respecting the provinces, into which I conceive India and the adjacent countries may be divided. The provinces as now proposed depend in a great measure on physical demarcation, and are therefore to some extent natural divi-

sions, though they might, if regard were had solely to their (molluscos) fauna, be again subdivided, but I prefer the more comprehensive natural boundaries, as at once more intelligible and real.

It may be urged with some show of truth, that the altitude of a range or district, exercises a similar influence on its fauna, that a change of latitude does, and that consequently mere geographical divisions are arbitrary, unless consideration is also had to the modifying influence of the height of the country embraced within it, but whilst admitting that altitude corresponds in a manner, as far as climate goes, with latitude, and that similar faunas maintain a co-relation with either a certain latitude or corresponding altitude, yet it does not seem that these similar conditions give rise to specific identity as a result, thereby diminishing the significance of specific areas; but rather that such similarity of conditions permits of the presence of interlopers or stragglers from other areas, without such examples ever rising above the category of exceptional cases.

The six provinces which I think can naturally be established, are as follows :—

Province I.—The Himalayan, embracing the main and lower ranges of the Himalayas, together with the Khasi and Jynteah Hills.

Province II.—The central, embracing the plains of India, South of Province I. including and bounded by the valleys of the Ganges, Indus, Taptee and Godavery.

Province III.—The Southern, embracing Peninsular India, South of Province II.

Province IV.—The Birmese, embracing Arrakan, British and Independent Birma, the Tenasserim Provinces and adjacent Islands.

Province V.—The Cingalese.

Province VI.—The Germanic (in part), embracing Afghanistan and the Thibetan face of the Himalayas.

The Table given below exhibits the number of species of each genus of the Helicidæ and Cyclostomidæ in India, and the number of species which may be termed "*vagrant*," or which range beyond the limits of one or more provinces, but of course, when so many additions are being made yearly to the list of our Indian shells, this Table can only be taken as illustrating a general proposition, and not as



having pretensions to absolute accuracy, as to the actual number of species described up to date. Some shells too, regarded by me as mere varieties, are by some esteemed species, so that if the latter view prove correct, a reduction would be effected in the number of vagrant species *e. g.* *Helix bistrialis* (*H. Ceylanica*,) and all additions will probably go to swell the numbers of species possessing a restricted area, rather than those of more extended distribution, so that the numbers given above are I think sufficiently correct, and the data ample enough as they stand, to support the proposition which I wish to establish, viz., that species which from their wide diffusion may be termed "*migratory*," are more aptly described as "*sporadic*" and that so far from the fact of their wide distribution being the result of a general law, or of certain universal conditions favourable to their dispersion, it is plainly an exception, and moreover, so very exceptional as to militate strongly against the idea of any law or conditions favourable to migration, ever having existed, so far as we may judge by results.

The following species are excluded from my list.

|                                           |   |                                               |
|-------------------------------------------|---|-----------------------------------------------|
| <i>Helix pullula</i> , <i>B. MSS.</i> ,   | = | <i>H. acris</i> , <i>B.</i>                   |
| <i>H. bombax</i> , <i>B.</i>              | = | <i>Streptaxis Petiti</i> , <i>Gould. juv.</i> |
| <i>H. ceryx</i> , <i>B.</i>               | = | <i>Leptopoma aspirans</i> , <i>B. juv.</i>    |
| <i>H. Ceylanica</i> , <i>Pfr.</i>         | = | <i>H. bistrialis</i> , <i>Beck.</i>           |
| <i>H. puteolus</i> , <i>B.</i>            | = | <i>H. clathratula</i> , <i>Pfr.</i>           |
| <i>H. Laidlayana</i> , <i>B.</i>          | = | <i>H. trifasciata</i> , <i>Ch.</i>            |
| <i>H. Bactriana</i> , <i>Hutton.</i>      | = | <i>H. strigella</i> , <i>Drap.</i>            |
| <i>H. uncinata</i> , <i>B.</i>            | = | <i>H. propinqua</i> , <i>Pfr.</i>             |
| <i>H. petrosa</i> , <i>Hutton.</i>        | = | <i>H. vitrinoides</i> , <i>Desh.</i>          |
| <i>H. Zoroaster</i> , <i>Theobald,</i>    | = | <i>H. similaris</i> , <i>Fèr.</i>             |
| <i>Bulimus Andamanensis</i> , <i>Th.</i>  | = | <i>Spiraxis Haughtoni</i> , <i>B.</i>         |
| <i>B. Jerdoni</i> , <i>B.</i>             | = | <i>B. Abyssinicus</i> , <i>Rup.</i>           |
| <i>B. rivicola</i> , <i>B.</i>            | = | <i>B. arcuatus</i> , <i>Hutton.</i>           |
| <i>B. pullus</i> , <i>Gray.</i>           | = | <i>B. insularis</i> , <i>Ehr.</i>             |
| <i>B. atricallosus</i> , <i>Gould.</i>    | = | <i>B. perversus</i> , <i>L.</i>               |
| <i>B. citrinus</i> , <i>Reeve.</i>        | = | <i>B. perversus</i> , <i>L.</i>               |
| <i>B. latebricola</i> , <i>B.</i>         | = | <i>Achatina latebricola</i> , <i>B. sp.</i>   |
| <i>B. tutulus</i> , <i>B.</i>             | = | <i>Pupa tutula</i> , <i>B. sp.</i>            |
| <i>Achatina frumentum</i> , <i>Reeve.</i> | = | <i>A. gemma</i> , <i>B.</i>                   |
| <i>A. ceylanica</i> , <i>Reeve.</i>       | = | <i>A. punctogallana</i> , <i>Pfr.</i>         |
| <i>A. Nilagirica</i> , <i>B.</i>          | = | <i>A. Perrotteti</i> , <i>Pfr.</i>            |

Table I. exhibiting the numbers of the *Helicidæ* in India and the proportion of vagrant species which range beyond the bounds of a single Province.

| <i>Helicidæ.</i>   | <i>Total of species.</i> | <i>Vagrant species.</i> |
|--------------------|--------------------------|-------------------------|
| Vitrina,.....      | 12                       | None                    |
| Cryptosoma,.....   | 2                        | 1                       |
| Succinea, .....    | 12                       | None                    |
| Helix, .....       | 221                      | 14                      |
| Hypselostoma,..... | 2                        | None                    |
| Streptaxis, .....  | 9                        | None                    |
| Bulimus, .....     | 52                       | 7                       |
| Achatina, .....    | 39                       | 3                       |
| Boysia, .....      | 1                        | None                    |
| Pupa, .....        | 18                       | 1                       |
| Clausilia, .....   | 7                        | None                    |
|                    | <hr/> 375                | <hr/> 26                |

The following are the vagrant species and those only are marked thus (\*) whose distribution is peculiar, as, of course, where provinces meet, some few species trench on the adjoining province without properly belonging to it, so that the actual number of truly vagrant species is less than the number of the above table. For some of my data marked thus (†) I am indebted to my friends the Messrs. Blanford.

|                                |                        |
|--------------------------------|------------------------|
| <i>Cryptosoma planospira</i> , | Provinces I. and II.   |
| <i>Helix Barrakporensis</i> ,† | Provinces I. and III.† |
| <i>H. bistrialis</i> ,         | Provinces III. and V.  |

I include this species as I regard *H. Ceylanica* as a mere variety of it.

|                      |                               |
|----------------------|-------------------------------|
| <i>H. castra</i> ,*  | Provinces I. III. IV. and V.† |
| <i>H. capitum</i> ,* | Provinces I. and II.          |

A rare shell in the two localities known to me, the Katak jungles and hills North of Tirhoot.

|                           |                        |
|---------------------------|------------------------|
| <i>H. climacterica</i> ,† | Provinces I. and IV.†  |
| <i>H. delibrata</i> ,*    | Provinces I. and IV.   |
| <i>H. fallaciosa</i> ,    | Provinces III. and V.† |
| <i>H. fastigiata</i> ,*   | Provinces I. and III.† |
| <i>H. Huttoni</i> ,*      | Provinces I. and III.† |

|                                                                                      |                                                                   |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| <i>H. ligulata</i> ,                                                                 | Provinces II. and III.                                            |
| <i>H. similaris</i> ,*                                                               | Provinces II. and IV. also Singapore, Mauritius, Brazil, &c., &c. |
| <i>H. Tranquebarica</i> ,                                                            | Provinces III. and V.                                             |
| <i>H. Lychnia</i> ,*                                                                 | Province V.† also Singapore.                                      |
| <i>H. vitrinoides</i> ,*                                                             | Provinces I. II. and III.                                         |
| <i>Bulimus Bengalensis</i> ,                                                         | Provinces I. and II.                                              |
| <i>B. Sindicus</i> ,                                                                 | Provinces I. and II.                                              |
| <i>B. gracilis</i> ,*                                                                | Provinces I. II. III. IV. and V. also Mauritius.                  |
| <i>B. cœnopictus</i> ,*                                                              | Provinces II. III. IV. and V. and Mozambique.                     |
| <i>B. insularis</i> * (pullus, Gray),                                                | Provinces II. III. and IV. also Red sea, &c., &c.                 |
| <i>B. punctatus</i> ,*                                                               | Provinces II. III. and V. also East coast of Africa, &c.          |
| <i>B. Abyssinicus</i> ,*                                                             | Province II. and Abyssinia.                                       |
| <i>Achatina punctogallana</i> ,                                                      | Provinces III. and V.†                                            |
| <i>A. Oreas</i> ,                                                                    | Provinces II. and III.†                                           |
| <i>A. tenuispira</i> ,                                                               | Provinces I. and IV.                                              |
| Achatina fulica I do not include, as it was introduced very recently from Mauritius. |                                                                   |
| <i>Pupa bicolor</i> ,*                                                               | Provinces I. II. III. IV. and V.                                  |

Table II. Cyclostomidæ.

| <i>Cyclostomidæ.</i>         | <i>Total of species.</i> | <i>Vagrant species.</i> |
|------------------------------|--------------------------|-------------------------|
| <i>Pomatias</i> ,.....       | 2                        | None                    |
| <i>Hydrocena</i> , .....     | 5                        | None                    |
| <i>Otopoma</i> , .....       | 1                        | 1                       |
| <i>Hybocystis</i> , .....    | 1                        | None                    |
| <i>Clostophis</i> , .....    | 1                        | None                    |
| <i>Opisthostoma</i> , .....  | 1                        | None                    |
| <i>Cyclophorus</i> , .....   | 49                       | 2                       |
| <i>Lagocheilus</i> ,.....    | 2                        | None                    |
| <i>Leptopoma</i> , .....     | 11                       | None                    |
| <i>Megalomastoma</i> , ..... | 3                        | None                    |
| <i>Cataulus</i> , .....      | 13                       | None                    |
| <i>Pupina</i> ,.....         | 6                        | None                    |

|                    | <i>Total of species.</i> | <i>Vagrant species.</i> |
|--------------------|--------------------------|-------------------------|
| Pterocyclos, ..... | 12                       | None                    |
| Spiraculum, .....  | 2                        | None                    |
| Cyclotus, .....    | 5                        | None                    |
| Aulopoma, .....    | 4                        | None                    |
| Rhiostoma, .....   | 1                        | None                    |
| Cyathopoma, .....  | 3                        | None                    |
| Alycæus, .....     | 30                       | None                    |
| Streptaulus, ..... | 1                        | None                    |
| Rhaphaulus, .....  | 1                        | None                    |
|                    | <hr/> 154                | <hr/> 3                 |

The only three vagrant species are

|                         |                           |
|-------------------------|---------------------------|
| Cyclophorus involvulus, | Provinces II. III. and V. |
| C. pyrotrema,           | Provinces I. II. and IV.  |
| Otopoma clausum,*       | Province II. and Arabia.  |

*Summary.*

|               |                                  |       |     |
|---------------|----------------------------------|-------|-----|
| Province I.   | Total of species, .....          | 148   |     |
|               | vagrants, .....                  | 17    |     |
|               |                                  | <hr/> | 131 |
| Province II.  | Total, .....                     | 79    |     |
|               | vagrants, .....                  | 21    |     |
|               |                                  | <hr/> | 58  |
| Province III. | Total, .....                     | 59    |     |
|               | vagrants, .....                  | 8     |     |
|               |                                  | <hr/> | 51  |
| Province IV.  | Total, .....                     | 145   |     |
|               | vagrants, .....                  | 12    |     |
|               |                                  | <hr/> | 133 |
| Province V.   | Total, .....                     | 130   |     |
|               | vagrants, .....                  | 7     |     |
|               |                                  | <hr/> | 123 |
|               | Total vagrants in all provinces, |       | 29  |
|               |                                  | <hr/> |     |
|               |                                  |       | 525 |
|               |                                  | <hr/> |     |

\* This may be excluded, the shell from W. India being distinct.—Ed.

The following is a list of the land mollusca distributed through the different Provinces, though some may be erroneously placed, from the loose manner in which some species are described as simply "from India" by authors. Vagrants marked thus. (\*)

Province I.—THE HIMALAYAN.

*Family Limacidæ.*

*Limax altivagus*, *Th.* MSS.

*L. modestus*, *Th.* MSS.

*Family Helicidæ.*

*Hoplites Cassiacus*, *Th.* MSS.

*Vitrina gigas*, *B.*

*V. salius*, *B.*

*V. scutella*, *B.*

*V. cassida*, *Hutton.*

*V. monticola*, *B.*

*Cryptosoma planospira*, *B.\**

*Succinea indica*, *Pfr.*

*Helix acris*, *B.*

*H. anopleuris*, *B.*

*H. Barakporensis*, *Pfr.\**

*H. bascunda*, *B.*

*H. Blanfordi*, *Th.*

*H. bullula*, *Hutton.*

*H. calpis*, *B.*

*H. camura*, *B.*

*H. capitium*, *B.\**

*H. castor*, *Th.*

*H. castra*, *B.\**

*H. celox*, *B.*

*H. cestus*, *B.*

*H. convexa.*

*H. chloroplax*, *B.*

*H. climacterica*, *B.\**

*H. cyclotrema*, *B.*

*H. corys*, *B.*

*H. cycloplax*, *B.*



- Helix delibrata*, *B.\**  
*H. diplodon*, *B.*  
*H. fragilis*, *Hutton.*  
*H. fastigiata*, *Hutton.\**  
*H. galea*, *B.*  
*H. glauca*, *B.*  
*H. Himalayana*, *Lea.*  
*H. Hodgsoni*, *B.*  
*H. humilis*, *Hutton.*  
*H. Huttoni*, *B.\**  
*H. hyba*, *B.*  
*H. labiata*, *Pfr.*  
*H. lubrica*, *B.*  
*H. macroleuris*, *B.*  
*H. nana*, *Hutton.*  
*H. nuda*, *Pfr.*  
*H. ornatissima*, *B.*  
*H. orobia*, *B.*  
*H. oxytes*, *B.*  
*H. patane*, *B.*  
*H. (Plectopylis, B.) pinacis*, *B.*  
*H. planiusecula*, *B.*  
*H. (Plectopylis, B.) plectostoma*, *B.*  
*H. Pollux*, *Th.*  
*H. radiceicola*, *B.*  
*H. rimicola*, *B.*  
*H. rorida*, *B.*  
*H. splendens*, *Hutton.*  
*H. seposita*, *B.*  
*H. sequax*, *B.*  
*H. serrula*, *B.*  
*H. submissa*, *B.*  
*H. tapeina*, *B.*  
*H. tugurium*, *B.*  
*H. vesicula*, *B.*  
*H. vitrinoides*, *Dh.\**

var. *H. petrosa*, *Hutton.*

*Streptaxis Theobaldi.*

*Bulimus arcuatus*, *Hutton*.

*B. Bengalensis*,\* *Lam*.

*B. Boysianus*, *B*.

*B. cœlebs*, *B*.

*B. cornopictus*, *Hutton*.\*

*B. candelaris*, *Pfr*.

*B. ceratinus*, *B*.

*B. domina*, *B*.

*B. gracilis*, *Hutton*.\*

*B. insularis*, *Ehr*.\*

*B. Kunawarensis*, *Hutton*.

*B. rufistrigatus*, *B*.

*B. segregatus*, *B*.

*B. Sikkimensis*, *B*.

*B. Sindicus*, *B*.\*

*B. Smithii*, *B*.

*B. Sylheticus*, *B*.

*B. vibex*, *B*.

*Achatina Cassiaca*, *B*.

*A. crassula*, *B*.

*A. crassilabris*, *B*.

*A. hastula*, *B*.

*A. latebricola*, *B*.

*A. leptospira*, *B*.

*A. orobia*, *B*.

*A. pyramis*, *B*.

*A. tenuispira*, *B*.\*

*Pupa Huttoniana*, *B*.

*P. plicidens*, *B*.

*P. (Ennea) stenopylis*, *B*.

*P. (Ennea) bicolor*, *Hutton*,\*

*P. (Ennea) bora*, *B*.

#### *Family Auriculidæ.*

*Carychium indicum*, *B*.

#### *Family Diplommatinidæ.*

*Diplommatina Blanfordiana*, *B*.

*D. costulata*, *Hutton*.

Diplommatina folliculus, *Pfr.*

D. diplocheilus, *B.*

D. Huttoni, *Pfr.*

D. pachycheilus, *B.*

D. polypleuris, *B.*

D. pullula, *B.*

*Family Cyclostomidæ.*

Pomatias pleurophorus.

P. Himalayæ.

Hydrocena sarrita, *B.*

Cyclophorus Aurora, *B.*

var *C. stenomphalus*, *Pfr.*

C. exul, *B.*

C. Himalayanus, *Pfr.*

C. Pearsoni, *B.*

var *C. Bensoni*, *Pfr.*

C. phænotopicus, *B.*

C. pyrotrema, *B.\**

C. pinnulifer, *B.*

C. Siamensis, *Sow.*

C. tryblium, *B.*

C. zebrinus, *B.*

Lagocheilus tomotrema, *B.*

Leptopoma cybeus, *B.*

Megolomastoma funiculatum, *B.*

M. pauperculum, *B.*

Pupina imbricifera, *B.*

Pterocyclos Albersi, *Pfr.*

P. parvus, *Pearson.*

(var *P. rupestris* ?).

Spiraculum hispidum, *Pearson.*

S. sp. nov.

Alycæus bembex, *B.*

A. constrictus, *B.*

A. crenulatus, *B.*

A. gemmula, *B.*

A. hebes, *B.*

*Alycæus otiphorus*, *B.*

*A. physis*, *B.*

*A. prosectus*, *B.*

*A. plectocheilus*, *B.*

*A. styliifer*, *B.*

*A. strangulatus*, *Hutton.*

*A. Theobaldi*, *Blanford.*

*A. urnula*, *B.*

*Streptaulus Blanfordi*, *B.*

*Clausilia bacillum*, *B.*

*C. cylindrica*, *Hutton.*

*C. ignota*, *Th.*

*C. ios*, *B.*

*C. loxostoma*, *B.*

#### Province II.—THE CENTRAL.

##### *Family Oncidiadæ.*

*Oncidium*, *sp.*

##### *Family Limacidæ.*

*Limax Bengalensis*, *Th. MSS.*

*L. Memnon*, *Th. MSS.*

##### *Family Helicidæ.*

*Vitrina Bensoni*, *Pfr.*

*Cryptosoma planospira*, *B.\**

*Succinea Baconi*, *B.*

*S. Bensoni*, *Pfr.*

*S. crassiuscula*, *B.*

*S. daucina*, *B.*

*S. Girnarica*, *Th.*

*S. subgranosa*, *Pfr.*

*Helix asperella*, *Pfr.*

*H. Baconi*, *B.*

*H. Bajadera*, *Pfr.*

*H. Bombayana*, *Grat.*

*H. capitum*, *B.\**

*H. decussata*, *B.*

*H. infula*, *B.*

*H. interrupta*, *B.*

- Helix lecythis*, *B.*  
*H. ligulata*, *Fer.\**  
*H. Nagporensis*, *Pfr.*  
*H. orcula*, *B.*  
*H. propinqua*, *Pfr.*  
*H. similis*, *Fer.\**  
*H. subjecta*, *B.*  
*H. trifasciata*, *Ch.*  
*H. vitrinoides*, *Deh.\**  
*Bulinus Abyssinicus*, *Rup.\**  
*B. Bengalensis*, *Lam.\**  
*B. Boriliæ*, *B.*  
*B. cœnopictus*, *Hutton.\**  
*B. Estellus*, *Reeve.*  
*B. gracilis*, *Hutton.\**  
*B. insularis*, *Ehr.\**  
*B. militaris*, *Th. MSS.* (near *B. mavortius*, *R.*)  
*B. pertica*, *B.*  
*B. pretiosus*, *Cantor.*  
*B. punctatus*, *Anton.\**  
*B. Salsicola*, *B.*  
*B. Sindicus*, *B.\**  
*Achatina amentum*, *B.*  
*A. balanus*, *B.*  
*A. fulica*, (introduced).  
*A. gemma*, *B.*  
*A. iota*, *B.*  
*A. notigena*, *B.*  
*A. oreas*, *B.\**  
*A. prælustris*, *B.*  
*A. sarissa*, *B.*  
*A. scrutillus*, *B.*  
*Pupa bathyodon*, *B.*  
*P. bicolor*, *Hutton.\**  
*P. brevicostis*, *B.*  
*P. diploos*, *B.*  
*P. planyunculus*, *B.*  
*P. seriola*, *B.*



Pupa tutula, *B.*

Boysia Bensoni, *Pfr.*

*Family Auriculidæ.*

Camptonyx Theobaldi, *B.*

Melampus fasciatus,\* *Desh.*

M. pulchellus,\* *Petit.*

Pythia plicata.

Cassidula mustelina, *Desh.*

C. auris-felis, *Brug.*

Auricula Chinensis, *Pfr.*

A. auris-midæ, *L.\**

A. Gangetica, *B.*

A. fustis, *B.*

*Family Aciculidæ.*

Truncatella, *sp.*

*Family Cyclostomidæ.*

Otopoma clausum, *B.\*†*

Cyclophorus indicus, *Desh.*

C. involvulus *Mull.\**

C. pyrotrema, *B.\**

Pterocyclos rupestris, *B.*

Cyclotus spurcus, *Grat.*

C. semistriatus, *Sow.*

C. subdiscoideus, *Sow.*

Province III.—THE SOUTHERN.

*Family Helicidæ.*

Succinea rugosa, *Pfr.*

Helix aceducta, *B.*

H. ampulla.

H. basileus, *B.*

H. Belangeri, *Dh.*

H. bidenticulata, *B.*

H. cacuminifera, *B.*

H. crinigera, *B.*

H. cysis, *B.*

H. fastigiata, *Hutton.\**

† See note *ante* p. 364.—Ed.

- Helix* Guerini, *Pfr.*  
*H. Indica*, *Pfr.*  
*H. Nilagirica*, *Pfr.*  
*H. Perrotteti*, *Pfr.*  
*H. (Plectopylis) retifera*, *B.*  
*H. ruginosa*, *Fer.*  
*H. sordida*, *Pfr.*  
*H. semifusca*, *Desh.*  
*H. semirugata*, *Beck.*  
*H. Shiplayi.*  
*H. solata*, *B.*  
*H. thyreus*, *B.*  
*H. Tranquebarica*, *Fabr.\**  
*H. vitellina*, *Pfr.*  
*Streptaxis Perrotteti*, *Petit.*  
*S. Watsoni*, *Blanford.*  
*Bulimus cœnopictus*, *Hutton.\**  
*B. gracilis*, *Hutton.\**  
*B. insularis*, *Ehr.\**  
*B. Nilagiricus*, *Pfr.*  
*B. physalis*, *B.*  
*B. punctatus*, *Anton.\**  
*Achatina Bensoniana*, *Pfr.*  
*A. botellus*, *B.*  
*A. Punctogallana*, *Pfr.*  
*A. facula*, *B.*  
*A. Jerdoni*, *B.*  
*A. oreas*, *B.\**  
*A. Perrotteti*, *Pfr.*  
*A. Shiplayi.*  
*Pupa (Ennea) bicolor*, *Hutton.\**  
*P. (Ennea) Pirrici*, *Pfr.*

Of the Auriculidæ of this Province I have no notes whatever.

*Family Diplommatinidæ.*

- D. Kingiana*, *Blanford.*  
*D. Nilgirica*, *Blanford.*  
*Opisthostoma Nilgircum*, *Blanford.*

*Family Cyclostomidæ.*

- Cyclophorus cœloconus, *B.*  
 C. deplanatus, *Pfr.*  
 C. Nilgiricus, *B.*  
 C. ravidus, *B.*  
 C. stenostomus, *Sow.*  
 C. Shiplayi, *Pfr.*  
 Pterocyclos Blandi, *B.*  
 P. bilabiatu8, *B.*  
 P. nanus, *B.*  
 Cyclotus montanus, *Pfr.*  
 Cyathopoma filocinctum, *B.*  
 C. malabaricum, *Blanford.*  
 Alycæus expatriatus, *Blanford.*  
 A. Footei, *Blanford.*

## Province IV.—THE BIRMESE.

*Family Oncidiadæ.*

- Vaginula Birmanorum, *Th. MSS.*

*Family Limacidæ.*

- Limax Peguensis, *Th. MSS.*

*Family Helicidæ.*

- Vitrina Birmanica, *Phil.*  
 V. Christianæ, *Th. MSS.*  
 Cryptosoma præstans, *Gould.*  
 Succinea semiserica, *Gould.*  
 Helix acerra, *B.*  
 H. achatina, *Gray.*  
 H. Akoutongensis, *Th.*  
 H. anceps, *B.*  
 H. artificiosa, *B.*  
 Helix arx., *B.*  
 H. Atkinsoni, *Th.*  
 H. attegia, *B.*  
 H. bifoveata, *B.*  
 H. bolus, *B.*  
 H. capessens, *B.*  
 H. cassidula.

- H. castra, *B.\**
- H. caussia, *B.*
- H. choinix, *B.*
- H. consepia, *B.*
- H. convallata, *B.*
- H. cyclaspis, *B.*
- H. delibrata, *B.\**
- H. Gordonix, *B.*
- H. galata, *B.*
- H. gratulans, *Blanford.*
- H. hariola, *B.*
- H. Haughtoni, *B.*
- H. Helfer, *B.*
- H. helicophora, *Blanford.*
- H. honesta.
- H. Huttoni, *B.\**
- H. infrendens, *B.*
- H. levicula, *B.*
- H. (Plectopylis) leiophis, *B.*
- H. Merguensis, *Phil.*
- H. molecula, *B.*
- H. octoplax, *B.*
- H. Oldhami, *B.*
- H. pausa, *B.*
- H. pauxillula, *B.*
- H. Peguensis, *B.*
- H. perpaula, *B.*
- H. petasus, *B.*
- H. petila, *B.*
- H. Phayrei, *Th.*
- H. pilidion, *B.*
- H. poongee, *Th.*
- H. pylaica, *B.*
- H. resplendens, *Phil.*
- H. refuga, *Gould.*
- H. retrorsa, *Gould.*
- H. rotatoria, *Von d Busch.\**
- H. sanis, *B.*

- H. stephus, *B.*  
H. Saturnia, *B.*  
H. scalpturita, *B.*  
H. similis, *Fer.\**  
H. textrina, *B.*  
H. Theodori, *Phil.*  
H. Tickelli, *Th.*  
H. trochalia, *B.*  
H. uter, *Th.*  
Sophina calias, *B.*  
S. forabilis, *B.*  
S. schistostelis, *B.*  
Hypselostoma tubiferum, *B.*  
H. Bensoni, *Blanford.*  
Streptaxis Andamanica, *B.*  
S. Petiti, *Gould.*  
S. exacuta, *Gould.*  
S. Sankeyi, *B.*  
S. sp.  
Bulimus cœnopictus, *Hutton.\**  
Bulimus Haughtoni, *B.*  
B. gracilis, *Hutton.\**  
B. insularis, *Ehr.\**  
B. putus, *B.*  
B. Janus, *Pfr.*  
B. moniliferus, *Gould.*  
B. Sinensis, *B.*  
B. Theobaldianus, *B.*  
Achatina Peguensis, *Bl.*  
A. pertenuis, *Bl.*  
A. tenuispira, *B.\**  
A. octona, *Gould.*  
Pupa bicolor, *Hutton.\**  
Clausilia insignis, *Gould.*  
C. Philippiana, *Gould.*  
*Family Auriculidæ.*  
Pythia plicata, *Pfr.\**  
Auricula dactylus, *Pfr.*  
A. auris-Midæ, *L.\**



*Family Diplommatinidæ.**Diplommatina sperata*, *Blanford*.*Family Cyclostomidæ.**Hydrocena illex*, *B.**H. frustrillum*.*H. pyxis*, *B.**H. Rawesiana*, *B.**Hybocystis gravida*, *B.**Clostophis Sankeyi*, *B.**Cyclophorus affinis*, *Th.**C. aurantiacus*, *Schurn*.*C. cucullatus*, *Gould*.*C. calyx*, *B**C. cornu-venatorium*, *Sow*.*C. cryptomphalus*, *B.**C. expansus*, *Pfr*.*C. excellens*, *Pfr*.*C. Haughtoni*, *Th.**C. balteatus*, *B.**C. foliaceus*, *Chem*.*C. fulguratus*, *Pfr*.*C. patens*, *Blanford*.*Cyclophorus flavilabris*, *B.**C. perdix*, *Sow*.*C. speciosus*, *Phil*.*C. scurra*, *B.**C. Theobaldianus*, *B.**Lagocheilus scissimargo*, *B.**Leptopoma aspirans*, *B.**L. Birmanum*, *Pfr*.*Megalomastoma sectilabrum*, *Gould*.*Pupina artata*, *B.**P. arula*, *B.**P. Peguensis*, *B.**P. sp.**Pterocyclos cetra*, *B.**P. pullatus*, *B.**Rhiostoma Haughtoni*, *B.*

- Alycæus amphora*, *B.*  
*A. armillatus*, *B.*  
*A. Andamaniæ*, *B.*  
*A. graphicus*, *Blanford.*  
*A. humilis*, *Blanford.*  
*A. Ingrami*, *Blanford.*  
*A. nitidus*, *Blanford.*  
*A. pyramidalis*, *B.*  
*A. polygonoma*, *Blanford.*  
*A. Richtofeni*, *Blanford.*  
*A. scepticus*, *Blanford.*  
*A. sculptilis*, *B.*  
*A. succineus*, *Blanford.*  
*A. umbonalis*, *B.*  
*A. vestitus*, *Blanford.*  
*Rhaphaulus chrysalis*, *Pfr.*  
*Helicina Andamanica*, *B.*  
*H. Merguiensis*, *Pfr.*

Province V.—THE CINGALESE.

*Family Oncidiadæ.*

- Vaginula maculata*, *Templeton.*

*Family Helicidæ.*

- Vitrina Edgariana*, *B.*  
*V. irradians*, *Pfr.*  
*V. membranacea*, *B.*  
*Succinea Ceylanica*, *Pfr.*  
*Helix bistrialis*, *Beck.\**  
*H. Ceylanica*, *Pfr.*  
*H. biciliata*, *Pfr.*  
*H. carneola*, *Pfr.*  
*H. Cingalensis*, *B.*  
*H. Chenui*, *Pfr.*  
*H. Charpentieri*, *Pfr.*  
*H. coriaria*, *Pfr.*  
*H. ceraria*, *B.*  
*H. concavospira*, *Pfr.*  
*Helix clathratula*, *Pfr.*

- Helix convexiuscula*, *Pfr.*  
*H. corylus*, *Reeve.*  
*H. cyix*, *B.*  
*H. Emiliana*, *Pfr.*  
*H. (Corilla). erronea*, *Pfr.*  
*H. fallaciosa*, *Fer.\**  
*H. galerus*, *B.*  
*H. Ganoma*, *Pfr.*  
*H. Gardneri*, *Pfr.*  
*H. hæmastoma*, *L.*  
*H. hyphasina*, *Pfr.*  
*H. Isabellina*, *Pfr.*  
*H. Juliana*, *Gray.*  
*H. Layardi*, *B.*  
*H. lychnia*, *B.\**  
*H. miccyla*, *B.*  
*H. melanotragus*, *Born.*  
*H. superba*, *Pfr.*  
*H. mononema*, *B.*  
*H. marcida*, *B.*  
*H. nepos*, *Pfr.*  
*H. novella*, *Pfr.*  
*H. partita*, *Pfr.*  
*H. perfucata*, *Pfr.*  
*H. Phœnix*, *Pfr.*  
*H. politissima.*  
*H. regulata*, *B.*  
*H. (Corilla) Rivolii*, *Desh.*  
*H. Rosomonda*, *B.*  
*H. Skinneri*, *Reeve.*  
*H. semidecussata*, *Pfr.*  
*H. serrucula*, *Pfr.*  
*H. subopaca*, *Pfr.*  
*H. subconoidea*, *Pfr.*  
*H. Taprobanensis*, *Dohrn.*  
*H. Thwaitesi*, *Pfr.*  
*H. trifilosa*, *Pfr.*  
*H. umbrina*, *Reeve.*

- Helix vittata*, *Mull.*  
*H. vilipensa*, *B.*  
*H. Waltoni*, *Reeve.*  
*H. Woodiana*, *Pfr.*  
*Streptaxis Cingalensis*, *B.*  
*S. Layardiana*, *B.*  
*Bulimus albizonatus*, *Reeve.*  
*B. adumbratus*, *Pfr.*  
*B. Ceylanicus*, *Pfr.*  
*B. cœnopictus*, *Hutton.\**  
*B. fuscoventris*, *B.*  
*B. gracilis*, *Hutton.\**  
*B. intermedius*, *Pfr.*  
*B. Mavortius*, *Reeve.*  
*B. panos*, *B.*  
*B. proletarius.*  
*B. punctatus Anton.\**  
*B. rufopictus*, *B.*  
*B. trifasciatus*, *Brug.*  
*Achatina capillacea*, *Pfr.*  
*A. inornata*, *Pfr.*  
*A. nitens*, *Gray.*  
*A. punctogallana*, *Pfr.\**  
*A. pachycheila*, *B.*  
*A. parabilis*, *B.*  
*A. panætha*, *B.*  
*A. serena*, *B.*  
*A. veruina*, *B.*  
*Pupa bicolor*, *Hutton.\**  
*P. ceylanica*, *Pfr.*  
*P. mimula*, *B.*  
*P. muscerda*, *B.*

*Family Auriculidæ.*

- Melampus Ceylonicus*, *Petit.*  
*M. Layardi*, *H. et A. Adams.*  
*Pythia Ceylanica*, *Pfr.*  
*P. ovata*, *Pfr.*  
*Truncatella Ceylanica.*

*Family Cyclostomidæ.*

*Cyclophorus alabastrinus*, *Pfr.*

*C. annulatus*, *Trosch.*

*C. Bairdi*, *Pfr.*

*C. Ceylanicus*, *Sow.*

*C. cratera*, *B.*

*C. cytopoma*, *B.*

*C. cadiscus*, *B.*

*C. involvulus*, *Mull.\**

*C. loxostoma*, *Pfr.*

*C. punctatus*, *Grat.*

*C. parapsis*, *B.*

*C. parva*, *B.*

*C. Thwaitesi*, *Pfr.*

*Leptopoma apicatum*, *B.*

*L. conulus*, *Pfr.*

*L. elatum*, *Pfr.*

*L. flammeum*, *Pfr.*

*L. halophilum*, *B.*

*L. orophilum*, *P.*

*L. pæcilum*, *Pfr.*

*L. semiclausum*, *Pfr.*

*Cataulus Austenianus*, *Pfr.*

*C. aureus*, *Pfr.*

*C. Cumingi*, *Pfr.*

*C. decorus*, *B.*

*C. duplicatus*, *Pfr.*

*C. eurytrema*, *Pfr.*

*C. Layardi*, *Gray.*

*C. marginatus*, *Pfr.*

*C. pyramidatus*, *Pfr.*

*C. Templemanni*, *Pfr.*

*C. Thwaitesi*, *Pfr.*

*C. Blanfordi*, *Dohrn.*

*Pterocyclos bifrons*, *Pfr.*

*P. Cingalensis*, *B.*

*P. Cumingi*, *Pfr.*

*P. Troscheli*, *B.*



*Aulopoma grande*, *Pfr.*

*A. helicinum*, *Chem.*

*A. Itieri*, *Guer.*

*A. sphæroideum*, *Dohrn.*

#### Province VI.—THE GERMANIC.

But little is known of the portion of this vast province which comes within the scope of my remarks, and I merely allude to it, as many of its well known species wander down to the confines of India and must clearly be arranged by themselves.

#### *Family Limacidae.*

*Parmacella etnilla*, *Hutton.*

*Vitrina baccata*, *Hutton.*

*Succinea Pfeifferi*, *Ross.*

*S. putris*, *L.*

*Helix Candaharica*, *Pfr.*

*H. costata*, *Mull.*

*H. fulva*, *Drap.*

*H. nitida*, *Beck.*

*H. pulchella*, *Mull.*

*Bulimus eremita*, *B.*

*B. Griffithii*, *B.*

*B. lubricus.*

*Pupa muscorum*, *L.*

*P. lapidaria*, *Hutton.*

TABLE III.—*Exhibiting the numerical distribution of species in the Provinces.*

Some discrepancy may be remarked between this Table and Tables I. and II., as some species are included in them, whose exact habitat is not certainly known to me.

#### *Genera.*

#### *Provinces.*

|                                       | I. | II. | III. | IV. | V. | VI. |
|---------------------------------------|----|-----|------|-----|----|-----|
| <i>Oncidium</i> , <i>Buch.</i> .....  | 0  | 1   | 0    | 0   | 0  | 0   |
| <i>Vaginula</i> , <i>Fer.</i> .....   | 0  | 0   | 0    | 1   | 1  | 0   |
| <i>Limax</i> , <i>L.</i> .....        | 2  | 2   | 0    | 1   | 0  | 0   |
| <i>Parmacella</i> , <i>Cuv.</i> ..... | 0  | 0   | 0    | 0   | 0  | 1   |
| <i>Hoplites</i> , <i>Th.</i> .....    | 1  | 0   | 0    | 0   | 0  | 0   |
| <i>Vitrina</i> , <i>Drap.</i> .....   | 5  | 1   | 0    | 2   | 3  | 1   |
| <i>Cryptosoma</i> , <i>Th.</i> .....  | 1  | 1   | 0    | 1   | 0  | 0   |
| <i>Succinea</i> , <i>Drap.</i> .....  | 1  | 6   | 1    | 1   | 1  | 2   |

| Genera.                                             | Provinces. |     |           |     |     |     |
|-----------------------------------------------------|------------|-----|-----------|-----|-----|-----|
|                                                     | I.         | II. | III.      | IV. | V.  | VI. |
| <i>Helix, L.</i> .....                              | 53         | 17  | 22        | 55  | 51  | 5   |
| <i>Plectopylis, B.</i> (excluding <i>Corilla</i> ), | 2          | 0   | 1         | 4   | 0   | 0   |
| <i>Sophina, B.</i> .....                            | 0          | 0   | 0         | 3   | 0   | 0   |
| <i>Hypselostoma, B.</i> .....                       | 0          | 0   | 0         | 2   | 0   | 0   |
| <i>Streptaxis, Gray.</i> .....                      | 1          | 0   | 2         | 5   | 2   | 0   |
| <i>Bulimus, Scop.</i> .....                         | 18         | 13  | 6         | 9   | 13  | 3   |
| <i>Achatina, Lane.</i> .....                        | 9          | 10  | 8         | 4   | 9   | 0   |
| <i>Pupa, Drap.</i> .....                            | 5          | 7   | 2         | 1   | 4   | 2   |
| <i>Boysia, Pfr.</i> .....                           | 0          | 1   | 0         | 0   | 0   | 0   |
| <i>Clausilia, Drap.</i> .....                       | 5          | 0   | 0         | 2   | 0   | 0   |
| <i>Camptonyx, B.</i> .....                          | 0          | 1   | 0         | 0   | 0   | 0   |
| <i>Melampus, Mont.</i> .....                        | 0          | 2   |           | 0   | 2   | 0   |
| <i>Pythia, Bolten.</i> .....                        | 0          | 1   | No notes. | 1   | 2   | 0   |
| <i>Cassidula, Fer.</i> .....                        | 0          | 2   |           | 0   | 0   | 0   |
| <i>Auricula, Lam.</i> .....                         | 0          | 4   |           | 2   | 0   | 0   |
| <i>Carychium, O. F. Muller.</i> .....               | 1          | 1   |           | 0   | 0   | 0   |
| <i>Truncatella, Risso.</i> .....                    | 0          | 1   |           | 0   | 1   | 0   |
|                                                     | 104        | 71  | 42        | 94  | 89  | 14  |
| <i>Diplommatina, Benson</i> .....                   | 8          | 0   | 2         | 1   | 0   | 0.  |
| <i>Pomatias, Studer.</i> .....                      | 2          | 0   | 0         | 0   | 0   | 0   |
| <i>Hydrocena, Parreyss.</i> .....                   | 1          | 0   | 0         | 4   | 0   | 0   |
| <i>Otopoma, Gray</i> .....                          | 0          | 1   | 0         | 0   | 0   | 0   |
| <i>Hybocystis, Benson.</i> .....                    | 0          | 0   | 0         | 1   | 0   | 0   |
| <i>Clostophis, Benson.</i> .....                    | 0          | 0   | 0         | 1   | 0   | 0   |
| <i>Opisthostoma, Blanford.</i> .....                | 0          | 0   | 1         | 0   | 0   | 0   |
| <i>Cyclophorus, Montfort.</i> .....                 | 10         | 3   | 6         | 15  | 13  | 0   |
| <i>Iagocheilus, Theobald MSS.</i> ..                | 1          | 0   | 0         | 1   | 0   | 0   |
| <i>Leptopoma, Pfeiffer.</i> ..                      | 1          | 0   | 0         | 2   | 8   | 0   |
| <i>Megalomastoma, Guilding.</i> .....               | 2          | 0   | 0         | 1   | 0   | 0   |
| <i>Cataulus, Pfeiffer.</i> .....                    | 0          | 0   | 0         | 0   | 12  | 0   |
| <i>Pupina, Vignard</i> .....                        | 1          | 0   | 0         | 4   | 0   | 0   |
| <i>Pterocyclos, Benson.</i> .....                   | 2          | 1   | 3         | 2   | 4   | 0   |
| <i>Spiraculum, Pearson.</i> .....                   | 2          | 0   | 0         | 0   | 0   | 0   |
| <i>Cyclotus, Guilding.</i> .....                    | 0          | 3   | 1         | 0   | 0   | 0   |
| <i>Aulopoma, Troschel.</i> .....                    | 0          | 0   | 0         | 0   | 4   | 0   |
| <i>Rhiostoma, Benson.</i> .....                     | 0          | 0   | 0         | 1   | 0   | 0   |
| <i>Cyathopoma, Blanford</i> .....                   | 0          | 0   | 2         | 0   | 0   | 0   |
| <i>Alycaeus, Gray.</i> .....                        | 13         | 0   | 2         | 15  | 0   | 0   |
| <i>Streptaulus, Benson.</i> .....                   | 1          | 0   | 0         | 0   | 0   | 0   |
| <i>Rhaphaulus, Pfeiffer.</i> .....                  | 0          | 0   | 0         | 1   | 0   | 0   |
| <i>Helicina, Lamarek</i> .....                      | 0          | 0   | 0         | 2   | 0   | 0   |
|                                                     | 44         | 8   | 17        | 51  | 41  | 0   |
| Total number of species per Province,               | 148        | 79  | 59        | 145 | 130 | 14  |

*Account of a visit to the hot springs of Pai in the Tavoy district.**By Capt. J. F. STEVENSON, Deputy Commissioner.**(Communicated by T. OLDHAM, Esq., F. R. S.)*

I have the pleasure of sending with this letter, a case containing four quart bottles of water and confervæ, one soda water bottle of the same, and two packets of stones, which I collected a few days ago at the hot springs near *Pai* in this district.

The four quart bottles and the packet of stones not labelled, are all from the remarkable springs which I believe to be partially, (but I should say inaccurately,) described in Mason's Tenasserim, page 18. He says that "According to Phillips they are hotter than any on record out of volcanic regions, 'with the questionable exception of three springs in China, which probably exceeded the temperature of the air from 70 to 120 degrees.' The principal spring at *Pai*,—for there are several, is in a little sandy\* basin in the midst of granite rocks, on the margin† of a cold water stream, where it bubbles up from three or four vents, and on immersing the thermometer into one, the mercury rises to 198°, within fourteen degrees of boiling water. Its location is rather peculiar, not being in a valley like the others I have seen, but on the side of a hill more than a thousand‡ feet above the level of the sea, and surrounded by large masses of coarse-grained granite rocks, which seem to have been detached from the summit above."

These springs are in a small mountain stream called by the people, the hot-water stream, (*Ye boo Hkyoung*), and about 2 miles from the *Pai* river.

The soda-water bottle and the second packet of stones are labelled. They are from a small spring on the bank of, and quite close to the *Pai* river.

The *Pai* river is about 65 miles south from Tavoy town, near the Mergui boundary. It rises in the range of hills which intersects this district between the Tenasserim and the Tavoy river valleys,

\* No sand.

† See page 385.

‡ 300 feet.

and after a generally direct East and West course falls into the sea about 6 miles below the village of *Kyaukhtsay*.

*Pai Dap* the nearest village to the springs, is about 5 miles East, and inland from *Kyaukhtsay*; and thence to the great hot springs on the "hot-water stream," the distance is about  $10\frac{1}{4}$  miles: the direction of the road is generally East for about 8 miles, and then Southerly, up the course of the hot stream for about 2 miles.

I visited these streams about a week ago in company with the Rev. Charles Parish, Chaplain of Moulmein, and Lieutenant Harrison, Deputy Commissioner of Mergui. The following is a short and I fear unscientific account of the visit.

On the 21st January we left *Kyaukhtsay* about 6 A. M. and reached *Pai Dap* at 7.30. This is a neat village of ten houses, pleasantly situated on the North bank of the *Pai* river, about N. E. from *Kyaukhtsay*. It has a pretty good *Zayat* (rest house). The path hence runs about East; and generally through thick jungle. A good deal of cutting down was necessary, to open it up in some places: ground generally smooth and level. We halted after a brisk walk of 2 hours and 5 minutes, at a shady spot on the *Pai* stream, about  $7\frac{1}{4}$  miles from *Pai Dap*, and started again between 2 and 3 P. M. We were told that we were now about half way between *Pai Dap* and the stream: and before leaving *Pai Dap* we had been led to expect that we had a 20-mile march before us.

The distance from this halting-place proved to be only about 3 miles. The path much the same as in the first part of the journey, with one or two bad bits: it was rather more up and down, and crossed the *Pai* river in one or two deep places. The latter part, perhaps half of it, was up the course of the hot-water stream:—and we came to hot water, (that is the water of the stream was hot),  $\frac{1}{4}$  of a mile before we reached the springs.

A heavy column of steam, which I at first mistook for the smoke of camp fires, or burning jungle, shewed us the whereabouts of the hot springs, some 100 yards off. The last part of the path was a steep ascent, but we estimated that we had not ascended altogether more than 300 feet from *Pai Dap*. The total distance thence was about  $10\frac{1}{4}$  miles. We found the springs in a narrow granite rock channel, through which a shallow stream falls in little cascades, divided by small pools. The most striking feature of the scene was the jet of

steam which seemed to give off the greater portion of the clouds of steam overhead. It rushes out of a hole nearly midway down a cascade some 6 feet high, with a noise precisely like that of a steam-jet, and with such force, that it drives the water of the cascade horizontally out 4 or 5 feet. The water which issues from this hole with the steam, or at least comes into contact with the steam, was hot enough to boil an egg well enough to eat, in 3 minutes. There are several holes in the pools above this cascade, but all within 15 yards of it, from which hot water bubbles up. The stream above the pools containing these bubbling holes, is cold, and the water, close to and around the upper or higher holes of the stream, is also cold. The holes from which the hot water spouts up are all small: the water from them is so hot, that we boiled eggs in all of them, fit to eat in 3 minutes. No steam arose from these holes. The stream itself there is a cold stream, until it reaches the hot water springs or holes: from these, jets of hot water spout up into it, and the water below them becomes warm at once: below the cascade it is hot and continues so, as we proved, for a quarter of a mile; perhaps further on. You will observe that Mason records that the temperature of these springs is 198°. We all thought it that, if not higher. By an unfortunate mischance we had not a thermometer with us. The water had no unpleasant taste or smell.

There are other large and small jets of steam below the cascade; one about 30 yards lower down is a remarkable one. It escapes in a broad column from under a rock with the loud sound of an engine blowing off. All the rocks (granite) about the hot water are hot: and the ground on which we slept, about 30 yards from the stream, and several feet higher than it, became very hot under our beds at night. We removed some stones and found the ground hot beneath them. We dug a hole near our beds, and steam began to rise from it at 8 or 9 inches from the surface of the ground. Two of our party heard a rumbling sound several times during the night, which may have been thunder, but which appeared to us to be subterranean.

We walked only about two miles of the way back, and descended the rest of the distance in small bamboo rafts, (12 bamboos about 20 or 22 feet long), to *Pai Dap*: water distance, about 12 miles: time occupied, nearly 4 hours. About half way down we collected the water in the Soda water bottle, and the labelled stones, on the left



bank of the *Pai* river ; the water here was very shallow, without steam or bubbles. It contained much confervæ ; and you will see that the stones from it are coated with a saline crust.

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*Memorandum.*—By A. TWEEN, Esq.

I have examined the water from the spring near *Pai*. The substances present are Iron, Alumina, Lime, Potash, Soda, Silica, Hydrochloric Acid, Sulphuric Acid, Hydro-sulphuric Acid and Organic matter which is nitrogenous.

Of the 4 bottles sent, 2 were empty, one but half full, through being imperfectly corked, and the fourth held, besides water, a considerable quantity of stones and water plants.

The siliceous deposit contains in addition to Silica, Iron, Alumina, Lime, Potash, Soda, a trace of Magnesia, Carbonic Acid, Sulphuric Acid, Hydrochloric Acid and Organic Matter. There is about 12 to 14 per cent. of soluble matter, of which the greater part is Carbonate of lime.

The Soda water bottle which held water from the second spring had nothing in it but stones and confervæ. This had a fetid smell, was alkaline to test paper, and evolved Ammonia on being treated with Hydrate of lime.

Some of the stones which accompanied the Soda water bottle are coated with deposit from the spring, but not in any quantity : this is calcareous.

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*A visit to Xiengmai, the principal City of the Laos or Shan States.—*  
*By Sir ROBERT H. SCHOMBURGK, Kt. F. R. S., Her Majesty's*  
*Consul at Siam.*

It will be requisite before I read my remarks on Xiengmai to preface them by some observations. The journey was undertaken to acquire some knowledge of the interior of Siam as far as the city of Xiengmai,\* called variously Changmai, Zimay, Zumay, and in the inflated language of the Asiatics, by the Burmese, "the City of the Golden Palace," although if such a splendid structure once existed, it must have been swept away, for nothing palatial did I observe in the structure of any of the habitations in that city.

From Xiengmai, I planned to turn eastward to Maulmain and by the Gulf of Bengal to Tavoy, and to return from thence by crossing the great mountain chain to Bangkok.

His Majesty the first King had provided me with a royal letter, enjoining the authorities of the places through which we had to pass, to give us every assistance, and to provide us with provisions, where such were to be had, on the public account. Two comfortable boats, the oarsmen dressed in the Royal livery, were placed at my disposal; Mr. Clarke, one of the student interpreters of the Consulate, and two nephews of the King, sons of Prince Krom Lluang Wongsa, who were then residing with me in the Consulate, accompanied me.

We left Bangkok on the 12th of December, 1859, rapidly progressing, but having passed the tidal waters, we found soon that we had started a fortnight too late for our heavy boats. The river was rapidly falling, and we had often to dig channels through the sandbanks to get along.

On the 28th day after our departure from Bangkok, we reached Raheng the most southern of the Lao cities. Here we resolved at once to send the boats back to Bangkok, and to continue our journey over land on elephants.

This mode of travelling was certainly any thing but comfortable; and although we had two ponies to vary it occasionally, the fourteen days which we required to reach Lamboon were fatiguing and tedious

\* The late Bishop Palegoix explained to me that it was called Xiengmai, the new City, in contradistinction of the one which had been destroyed by the Baroma-zaxa-thirat in 1430.

enough. We arrived at Lamboon on the 11th of February and left it on the 14th, much to the regret of the Governor, who wished us to stay some time longer. I shall now take up my more detailed description of our further progress to Xiengmai, which is only one day's journey from Lamboon.

As already mentioned, we left Lamboon at half-past 9 o'clock A. M., of the 14th February, passed round the north gate and turned into the Xiengmai road. The suburb of the city extended for more than half a mile on our right. We traversed the canal which brings the water from the Méping to Lamboon, serving in its course to irrigate the whole adjacent country by numerous side canals. At the point where we forded it, branches as large as the main canal itself flow to the right and to the left. Indeed it was a perfect network of canalization, so that every cultivator might get his supply of water.

Villages and habitations were on both sides of our road. It was a succession of them ; generally surrounded with trees, they formed bands extending N. and S., between which, for miles in breadth, the ground was cultivated with rice.

Our road led us through the village of Luk—the *Wat* at its entrance is very neat ; the roof is supported within by eight columns of scarlet colour, richly ornamented with gilt tracery. The other buildings which belong to the *Wat* were merely built of unbaked bricks.

Having passed the groves of trees that surround the village, we saw before us on both sides of the canal, gardens planted with vegetables, tobacco, safflower, and here and there some indigo. A number of women and girls, some of the latter no more than five or six years of age, were employed to water the plants, while the men were sitting under the shade of a shelter, the frame prepared of bamboo and covered with large leaves, so constructed that it might be turned east or west according to the position of the sun, their only employment being to smoke and to see what the women and children were doing. To facilitate the method of irrigation a kind of huge shovel or ladle of basket-work, fixed to a pole, is used, which works upon a erinkle or fork, and dips in the canal ; the water is taken up and transferred to a tank, from whence it flows by trenches to the different parts of the field.

From Bang Pokok, a hamlet, the elephants had to wade for a considerable distance through water. The canal had been forced by a dam to throw its waters over the adjacent fields, to render them pro-

per for transplanting the yet tender rice-plants. What a multitude there were employed!—men, women and children, waded more than ankle deep,—every one so busy—a kind of basket slung over their shoulders which contained the young plants—a stick in their right hand, to thrust a hole in the soil below the water, the left ready to place there one of the seedlings, and to insure for it a hold by pressing the mud to its roots: the number of plants thus fixed into the soil in a given time, is very large.

Our harvest gatherings, the fields speckled with people, can only convey an idea of the prospect before me—and nevertheless how different the persons thus occupied, how different the scenery from that in my own home, which brought the comparison to my recollection!

Having passed the large village Tavong-tawng, we had to cross the river Ping to its right bank, (which, from its junction with the Wang forms the Me'nam). While fording it, I admired the pretty view which the tower or Pagoda of Wat Hong offered to us, rising to a height of above 150 feet, the river scenery lovely, with high mountains in the back ground, and the banks lined with numerous people, led by curiosity to see us pass, the fair sex dressed in Lao petticoats, which in consequence of their bright colours, added to the liveliness of the picture.

Having crossed the river, we saw Xiengmai before us, distant about a mile, the intervening space consisting of rice-fields, only interrupted by Wat Papá-ow surrounded by a wall and shaded by large trees. On approaching the city, I saw a number of peculiarly shaped towers, evidently built of bricks, and so odd in appearance that it seemed they had been standing there for centuries, without any person caring whether they might fall down, or be taken possession of by a tropical vegetation, which had already covered them with twiners and creepers. These towerlets are Phratshedees, the topes of Buddhist architecture.

Our residence had been erected outside the city walls, between the bridge which leads over the Méping and the east gate of Xiengmai. The principal house erected for our reception, was on a larger scale, and neater in execution, than any we had yet inhabited. Opposite stood the public Sala, a large wooden building; near it a little towerlet likewise of wood, as a look-out, and the usual stand for mounting and dismounting the elephants; the whole space, including the huts for our own servants, was surrounded by a fence constructed of bamboo.

With the exception of the Sala and the look-out, the other structures had been all expressly prepared for us—moreover sheds had been built outside the fence for our escort.

We found a large number of people assembled between the bridge and the city gate to witness our arrival ; some were standing ; others, sitting in groups or pressing near us. They were a medley crowd. The true Lao in turbaned kerchief, with his tartan-like Khatung, worn as the Scotch wear their plaid ; the Thai or Siamese merely girdled round the loins ; the fat smiling Chinese in his blue vestments ; and to make the medley still more conspicuous, there were likewise inhabitants from Muang Teli in the Chinese Province of Yunnan, a caravan of which had arrived a day or two previous : all these people added to the peculiarity of the scene before us. Fatigued, I slept soundly, but what a stir there was on awakening, from the early morning hours, in front of our residence. The bridge is the great public thorough-fare for the population residing on the left bank of the Méping, not only in the suburb, but likewise for those in the adjacent country. A number of these persons come daily to town, to sell or purchase : the women entered in parties, consisting of twenty or thirty ; seldom accompanied by men, passing in single file towards the city gate. The Lao females, have long glossy hair of an intense black, which, with tidy persons, is neatly plaited and gathered in a knot behind, the hair of the forehead being drawn up backwards in the manner of the Chinese women. They wear the Lao petticoat, more or less ornamented with gold thread, and embroidered with silk of bright colours. The married women are moreover dressed in a jacket or spenser, closely fitting as far as the waist, and from thence expanding more amply until it reaches nearly to the knee. This vestment resembles the polka spenser formerly so fashionable in England and on the Continent. Those who can afford it, have rich necklaces, and rings in their ears and on their fingers ; their arms and ankles surrounded by circlets of gold or silver ; a silk shawl or scarf of red or rose colour is thrown loosely over their shoulders. The latter refers to the married women—young ladies, unmarried, do not dress above their waist.

Black and shining as their hair is, the racemes of the white flowered Moringa or the fragrant Vateria, or if such be not in blossom, those of any other tree or plant similar in colour, set it off much more by



the great contrast, when these flowers are placed in their raven tresses. The mouth of the young girls is formed exquisitely. But few of the Lao women indulge in betel chewing, hence they do not render that organ, so fairly formed by nature, hideous by the prevailing custom of the Thai; and their teeth remain white as nature made them.

Though much fairer in colour, in stature they, like the Indians of Guiana, very seldom reach a height above 4 feet 10 inches.

The men wear generally the Khatung or Lao plaid, but a number are dressed in blue or white tunics, fitting closely and reaching like the spenser of the women to the knee. The hair of the head is allowed to grow; only when it becomes too long, it is cut; some have whiskers, a custom not adopted by the Thai, where nature has yielded him hairs on his cheeks. I observed but few instances of the tuft of hair on the crown, as worn by the Siamese proper.

They dress their children very neatly; on the head, they place a cap consisting of seven pieces, in the shape of a cardinal's cap, made of scarlet cloth with a band of black velvet below, embroidered with gold thread. Boys of six years and upwards, are dressed in the close fitting tunic, and, according to the wealth and standing of the parents they are made of velvet, or white cotton cloth.

The Laos consist, it may be said, of two clans, namely such as who, if men, paint their bodies from the waist to the knee, and designate themselves as the Thong dam or "black bellies," and the others who do not paint, as Thong Khao or "white bellies." I saw more of the former than of the latter in and about Xiengmai. The tattooing represents figures of dragons, tigers, labyrinths, &c. The operation of producing these figures is upon the same principle as our sailors employ, to have anchors, crosses and other figures printed upon their arms. Several of our own men had the operation performed, without exhibiting their suffering great pain under the operation.

There is little design in the tattooing; sometimes patches of colour produced by Indigo, exhibit no figure whatever.

The Guiana Indians show much more design in painting their bodies, and a belle of the Carib or Macusi tribe, will not consider it too tedious, when preparing for attendance at some great display, to submit to the painter's brush for 8 or 10 hours at a sitting.

The generality of the men and women among the Lao, walk like the Indians of Guiana, one foot set before the other, without turning the

little toe outside. They have another fashion similar to the Guianese, namely the ear-lap is bored and a piece of bamboo is inserted, its two ends ornamented by a piece of looking-glass ; or in lieu of the bamboo merely a scroll of bark is placed in the ear-lap. This fashion belongs more particularly to the inhabitants of the eastern province, of which Muang Nan is the capital. A number of these people were in Xiengmai on trading speculations, having brought cotton for sale to where but little is cultivated. They were staying on the other side of the river during their sojourn, and daily passed our place in going to the city : they could not fail attracting attention by their darker complexion and slighter stature than the Laos. Their dress is also very different : they have trowsers like the Chinese and a small jacket of cotton cloth, that once might have been white but now looks doubtful as regards colour. The hair is worn tied up in a knot at the back part of the head, like that of the Lao females, with the difference that they do not keep it in such good order. Their legs are painted like those of the Lao Thong-dam, and the head is covered by a plaited hat with a most expansive rim, to protect the bronze features of its wearer against the effects of the sun.

The Deputy Viceroy Chao Operat called on us shortly after noon. He was a man of an advanced age, dressed meanly without shirt or shoes, very different in appearance from any of the officials of a similar rank which I had previously met. He came on foot, observing that some disease from which he suffered, prevented him from riding on horseback. We of course used our ponies to carry us to his residence after our interview had ended, and he had proposed that we should accompany him there.

The King's letter was conveyed in the usual manner to the Deputy Viceroy's residence. The latter was anything but palatial for so high a personage : the greatest ornaments in the hall were a large number of embroidered pillows—similar to the one which I had received in Bangkok from his superior, the actual Viceroy Chao-kavi Rorot Suriwong, who was then there on a visit.

We had some difficulty to get a person to read the letter written to him by the King's order, which was in the Siamese language and characters : the Lao differs in both points, and I am told that the difference is more than dialectical. The Officer who came with us from Raheng, read it ultimately to the prostrate multitude, the Chao Operat

keeping his high backed chair, and we ours, for I made it always a point to have carried to such audiences, two cane chairs for myself and Mr. Clarke, which I had brought with me from Bangkok, (and I may as well observe *en parenthese*, I brought them back thither on my return).

As soon as the ceremony was performed, we returned to our residence; I saw already that Chao Operat was not very favourably inclined to us.

On our return from the Deputy Viceroy, we took a ride through the town. The bazar is held in the principal street, extending east and west: the goods for sale are exposed in open stalls along the lines of the street. They consist of English manufactured goods, such as cotton handkerchiefs, prints, cups and saucers, plates, needles and thread; raw silk from China, lacquered boxes from Ava and a number of knick knacks from other countries. For the sake of opposition, I believe, speculating geniuses exhibit for sale in the next stall, pork, vegetables, and the indispensable betel-nut with all its accessories. There were, likewise short clay-pipes and tobacco finely cut, similar to the Turkish, for supplying them with the necessary ingredient. The stalls in the bazar are tenanted by women, who, when their attention is not claimed by purchasers, occupy themselves with making those pretty embellishments or embroideries worked with gold thread and all kinds of coloured silks, which adorn the Lao ladies' petticoats. Others were occupied in embroidering upon black velvet, ornamental designs according to their conception, for the covering of head cushions, and here and there the mother would have her darling, of course the youngest, to nurse, notwithstanding that her fingers were busily employed in embroidering. The silk for the manufacture of petticoats, &c., is imported from the Chinese territories.

We extended our ride round the town "proper" not including the suburb. It is surrounded by a double wall—each wall having a ditch in front. The entrance to the town is by double gates with bastions to protect them. The suburbs are stockaded, but the gates of that portion of the town, are also fortified. I regret that some differences which arose between myself and Chao Operat, regarding the jurisdiction over British subjects residing in Xiengmai, rendered every act I did, suspicious in the eyes of that individual, and I could not ascertain with precision the extent of the city. I believe, however, that it is no less

than two miles and a half in length, including the suburb to the southwest. The number of inhabitants amounts probably to 50,000, of whom 5,000 are able to bear arms: such a contingent force was furnished to Prince Krom Lluang Wongsā in his late attack upon Chiangtung.

The streets of the city have originally been laid out at right angles. Time it seems has worked changes with regard to their regularity; nevertheless I have not seen any other Siamese city, laid out apparently so regularly at its foundation, as Xiengmai appears to have been.

The habitations are seldom, if ever, placed so as to front the street; they stand some distance back. In their structure they do not differ materially from such as I saw in the other Lao towns: however those of the high nobility are not surrounded with walls as in Lakong, to prevent any vulgar prying on what is going on within.

There are numerous Wats in the city, but none can vie in extent or appearance with Wat Luang in Lamboon. At some of the Wats I noted the peculiar towerlets or Phratshedees. The number of these isolated towerlets is large; they not only surround the city, but extend for a mile or more beyond it, principally to the west. I have already remarked that they are the topes of Buddhist architecture, erected to commemorate some of the actions of the last Buddha, when wandering upon our globe, promulgating his doctrines. I doubt that they contain relics. "We pray to Gaudama on passing a Phratshedee," an intelligent person told me, "they are built in memory of him and his divine acts, and some of his doctrines are written there on tablets."

These remarkable towers are only cased with stone-work and filled up with the soil from near to the place where they stand. I judge so from two or three instances where the stone casing had given way so as to expose the interior mass. Half way up the height of the tower, seen from outside, is a belt or string course—sometimes the space is divided and there are two; and at about 30 to 40 feet above the base, rises the dome, crowned by a *tee* with narrow blind windows, terminating in a spire consisting of from 5 to 7 umbrellas or disks, each decreasing in size until the spire ends in a sharp point, ornamented with small bells, that tinkle when they are moved by the wind. Only in a few instances the domes have retained their termination perfect: owing to neglect of the requisite repairs, they are mostly broken off.

The nature and object of topes at Xiengmai, the only place where I have seen them in Siam, not connected with Wats or forming parts



of the temple for worship, is no doubt the same as in Central India, in the Punjaub, Afghanistan and in Ceylon; either to contain relics of Buddha and his disciples, or to commemorate some of his acts during his pilgrimage upon earth.

There are few persons at Bangkok who have not heard of the celebrated image of Buddha, which, by those who follow his religion, is considered to be the acme of what can be adored in a visible shape. It is now in the Royal Wat.

This image was discovered in 1436 in the city of Chiangrai or Xiengrai about forty miles N. N. E. from Xiengmai. A small pagoda which contained this precious image, over which a second building had been erected, was struck by lightning, and thus it was exposed to view.

This precious image was removed to Xiengmai, (then as now the principal town of the Lao country,) which was being rebuilt after its destruction in 1430. Several other localities, amongst them Lamboon, were afterwards assigned to preserve it, until it was ultimately transferred to Bangkok in 1779. It was formerly reported the image had been worked out of an emerald, it is however only green jasper.

The bridge which leads over the Meping seems of considerable age: (the river is here 380 feet wide, as I ascertained by measurement,) and although men, horses and cattle pass over it, the elephants have to ford the river. These animals are too heavy for such a frail structure, of which the greater number of planks that stretch across horizontally, are not even fixed by wooden pegs or iron nails. The clattering noise of these loose planks, when a drove of oxen is passing over the bridge, is almost stunning, and has repeatedly awaked me out of sleep at night, when sounds are so much more distinct than during day.

There are many cocoa and betel-nut trees in and around Xiengmai. Oil is prepared from the first, and the betel-nut forms an article of commerce, being exported from Xiengmai, after setting aside what is used for home consumption. Indeed the produce of the trees for export is far from sufficient for the more eastern and northern Lao states, where few or none of the palms that produce the nut grow; hence large quantities are brought from Pegu and the Tenasserim provinces. Both these kinds of palms, namely the cocoa and betel, seem to thrive very well at Xiengmai. While I was there, two dry cocoa-



nuts were brought to me, grown at Xiengmai, the one measuring 2 feet 8 inches, the other 2 feet 6 inches in circumference.

Shaddocks or pumplemose, oranges, citrons and limes, bananas, and plantains are likewise raised, but of the two first kinds of fruits I have scarcely found one of a good taste. The Viceroy whom I met at Bangkok, told me, that there was only a single mangosteen tree in Xiengmai, and that in consequence of the cold temperature, it was in a sickly state and seldom produced fruit. At the bazar a number of kitchen herbs, may, however, be found, such as cucumbers, onions, garlic, beans, and lettuce.

The customs of the Lao people resemble in general those of the Siamese. Marriage contracts are made verbally, the parents of the girl receiving a compensation from the future husband, for the loss which they suffer by having no further assistance from their daughter in their daily labour. The amount of that compensation depends upon the bride's beauty, youth and family connections. It seems the minimum is 40 Rupees (£4.)

They practise cremation for such as die of a natural death—that is, if the relations can pay the expenses connected with it—but the remains of such as lose life by accident, as by drowning, by a fall, or being killed by an animal, cannot be burned but must be interred.

The smoking of cigars is very common amongst the women—they sometimes use pipes which are made of the rhizoma or rootstock of the bamboo, nicely carved. Little girls, no more than 6 or 7 years of age imitate their elders. It is quite amusing to see with what gravity these children enjoy their weed. On the other hand, I have not seen that the Lao females use the betel-nut to the same extent as the Siamese: hence, as I have already observed, they do not show those distorted mouths which disfigure the sex in Bangkok, and render their teeth black and corroded.

On the north-eastern angle of the town is an extensive marshy ground. During the rainy season it forms a large expanse of water which has given rise to the accounts that prevailed in the 17th and 18th century, that it was a large lake, something like the fabled lake of Parince of the western continent, a kind of Caspian, and that the Menam flowed out of it.

This famous lake which owes its existence to the low level of ground and its waters to the accumulation of rain or the overflowing

of the Méping which flows at a short distance, is frequented by a large number of wading birds, namely waterfowls, ducks, teal, egrets, and a kind of swan-goose. Nor is the Nock Bua wanting; and occasionally a *Karen bird*, the flesh of its breast yielding excellent steaks, may be shot there.

Amongst the articles which I saw carried for sale to the bazar, are large rolls of paper of the usual Siamese kind. It is prepared from the bark of two different kinds of trees, (one of which is the Ton Kain of the Siamese). Each roll of the manufactured paper consists of 3 sheets, 5 feet long and 2 feet 7 inches broad. Such a roll is sold at the rate of the eighth of a rupee or about three pence. They give it sometimes a greenish or bluish tint, but in general it is of a dusky white.

Chao Operat had expressed a wish to present some gifts, according to Lao custom to the young princes Ong Teng and Ong Sawa who were with me. The ceremony took place in the large Sala adjacent to our residence. The Deputy Viceroy did not come himself, but sent one of his high nobles accompanied by some other officers of rank.

Two pyramids of flowers, consisting of three rows, one above the other, but each smaller than the preceding and the whole about 5 feet high, were carried before the procession—then came two smaller ones, of more intrinsic value, each of the branchlets of the pyramids ending in a kind of network with a rupee in it. There were 50 of these on one tree, and 49 on the other, the missing one having probably found its way to the fob of one of the attendants, or rather to the corner of his girdle.

The pyramids having been placed in the middle of the Sala, a number of dishes with legs of pork, fowls, fish, eggs, fruits, vegetables, &c., were placed around them. Ong Teng and Ong Sawa squatted on the ground near the pyramids; one of the noblemen then stepped forward, and having seated himself near the young princes, he made his salaam and took a book out of his girdle, and read a homily or prayer of ten tedious pages, addressed to Buddha, invoking him to protect the young princes during their journey, and to vouchsafe their safe return to their parents and friends. The prayer finished, he tore down one of the long cotton threads which were hanging from the branches of the larger pyramids, and taking the end part, about four inches in length, in his hands, he passed the rest from the wrist of Ong Teng to the end of the boy's forefinger, murmuring all the time some sentence or incantation—he then tore off the short end which he had kept in his hand,

and threw it away, for in it according to their superstition all the evil was embodied, winding, as already mentioned, the long part of the thread around the wrist as a talisman. The same operation was gone through with the left hand. Some of the noblemen who were present followed his example, and the second prince Ong Sawa having been performed upon in a similar manner, the ceremony was over. Not the slightest decorum was observed during it, the people present talking, smoking, and making jokes while the exhortation was being read.

I had observed at a short distance between our residence and the city wall, two monuments or resting-places of the dead, surrounded by a railing and kept in good order. It was entirely an accident that I addressed the Chao Ratcheput who was close to me in the Sala when the ceremony took place, asking him whose graves they were. "They are those of my parents," he said, "their ashes after cremation had taken place, were interred here. Twice a year I come to put flowers over their graves, and have the railing restored."

I thought that this care bestowed upon the resting-place of his parents showed as deep an affection as the temples erected by the high nobility and the opulent in Bangkok, over the graves of their nearest relations.

Our delay at Xiengmai became irksome. Chao Operat put all possible difficulties in the way of our departure. In consequence of his detaining some British subjects against their will in Xiengmai, I had some differences with him and from that time none of the persons who had been previously so friendly with us, ventured to come near us—nay, we even found difficulties in purchasing provisions, the people being afraid to sell to us. After repeated delays we got under way at last on the 27th of February, having been detained thirteen days in Xiengmai. The number of elephants at starting was not complete and Chao Operat refused obstinately to let us have any horses, although it was expressly mentioned in the king's letter. It was then that Chaopuri-eatenah, seeing our disappointment, presented to Mr. Clarke and myself, each a pony of his own stud, so that we might occasionally relieve the monotony and hardship of elephant riding. I felt grateful to the donor, and brought the pony safely with me to Bangkok.

I shall now hurry on to the conclusion. The number of elephants was ultimately increased to 39—our escort consisted of 55 soldiers and 85

persons to attend to the elephants, carriers, &c., indeed ourselves included and the boatmen from Bangkok, we mustered 150 men. We had to traverse the regions infested by the Red Karens, a wild and predatory Indian tribe, who had recently been very troublesome; hence so numerous an escort was requisite.

Although we had not received much courtesy and attention from the Operat while in Xiengmai, he had by all means exercised his authority under the King's letter, and as long as we travelled in the Siamese territory, we found comfortable night quarters erected, when arriving at our halting-place, a party having been always sent in advance for that purpose.

The journey from Xiengmai to Maulmain occupied us twenty-four days; from thence we went by steamer to Tavoy, and again resorting to elephants for our transport, we crossed the great Central mountain ridge, which being a spur of the great Himalaya, traverses the Malay Peninsula, and ends at Cape Romania. We had a journey of eight days from Tavoy to the mouth of the Menam noi where that rivulet falls into the Canbari river near Chai-Yoke. Our journey from Tavoy to Chai-Yoke occupied eight days, the report that it is only a distance of a couple of days is erroneous. At last we arrived safely at Bankok.

We had been absent from it 135 days, 86 of which found us under way.

We felt very grateful that our journey had been accomplished without any further drawback than the loss of nearly all that I had collected in illustration of Natural History. Five days of almost incessant rains during our journey from Tavoy to the central mountain ridge, was sufficient to defy the precautions which had been taken to secure my gatherings: moreover in lieu of the nice howdees which we had in our journey from Xiengmai, here we had miserable structures, only to be compared to the crates in which earthenware is packed, and open to the whole influence of the weather. During the period that we had to undergo this ordeal, the order of the day was, that every one of us, previous to the morning's cup of coffee being served, had to take two grains of quinine in a wine-glass full of water—and to this remedy next to God's will, I ascribe it, that all of us escaped the pernicious jungle fever, more fatal to Europeans and Americans at the setting in of the rainy season than at any other time.

*\*Notes on the Tribes of the Eastern Frontier, No. I.—By J. H. O'DONEL, Esq., Revenue Surveyor of Arracan.*

*(Communicated by A. GROTE, Esq.)*

The Survey of the northern portion of the Akyab district and the remaining portion of the frontier bordering on Chittagong was finished in March last. A high range of hills, called Modooting, Mraneedong and Yandong forms a natural boundary between the two districts. Opposite Tulukmee the altitude is about 2,500 feet, farther north the altitude increases to 5,000 feet at Yandong. To the eastward of this boundary range the Koladyne river flows at a distance of 10 to 16 miles. From Tulukmee northwards and within 12 miles along the banks of the river, there are 6 villages on the right bank and four on the left bank; no other villages are met with higher up for 60 miles, the intermediate country being totally uninhabited. The Loosai Kookees reside on the west of the boundary range. The independent Shendoos occupy the tract of country to the east of the Koladyne river, from the mouth of the Sulla Kheong northwards. Further north, to the 23rd parallel of north latitude, the country is occupied by the independent tribes of Muneepoor, Arracan and Ava; there is no recognised frontier in that direction and it will be necessary to fix a frontier line after the survey towards the Yeomadoung range is finished.

In 1851 Captain Tickell proceeded as far as Tulukmee and tried to induce the Khoomee Chiefs to come in. From his published Journal, it appears that 4 or 5 subordinate chiefs attended, but the heads of the most powerful clans made excuses. It was not however till the last cold season that the first attempt was made to explore the country on the Upper Koladyne, occupied by fierce wild tribes, who have for years committed periodical aggressions on the inhabitants of the lower hills and lowland border villages both in the Akyab and Chittagong districts. In April and May 1859, several dacoities were committed on the Myo river and within the northern lowland circles on the Koladyne; many persons were killed, and their wives and children carried away as slaves and sold. In Dec. 1859 a dacoity was committed 5 miles from my camp at Ralla. The coolies were so alarmed, that a few days after, most of them deserted.

\* Extract from a letter to the Commissioner of Arrakan.



The Koladyne circle includes within its limits an area of 2,652 square miles. The population consists of Khcongthas, Mroos, Khoomees and Shendoos, all distinguished from the people of the plains by peculiar usages. The Khcongthas live in 9 villages, intermixed with the Khoomees far apart from each other: they number 713 souls. Of these, 189 are cultivators who pay 5 Rs. each annually, 1 Rupee land rent and 4 Rupees capitation tax. The Mroos occupy 12 villages on the Mee Kheong all within 8 miles of Koladyne Thannah; they number 839 souls; of these 136 are cultivators who pay 3 Rupees each annually. Both Kheongthas and Mroos are in general quiet, inoffensive people, similar to the Joomeea Mughis. Tulukmee is a Kheongtha village with thirty houses; during the day the people live on land, but at night they occupy large substantial floating huts moved into the middle of the stream, being afraid of the secret and sudden attacks made by their wild neighbours.

The Khoomees, the largest and most important of the hill tribes in Arracan, occupy the country on both banks of the Koladyne river, from the thannah to the mouth of the Sulla Kheong. Their chief occupation apparently is agricultural industry and they manufacture cloths, spears and gunpowder. All or nearly all practise dacoity. They do not acknowledge the authority of any Rajah or paramount chief, and although they respect and obey their own village chiefs and heads of clans, each chieftain is in some measure under the control of the confederate chiefs. They are divided into 27 clans, who occupy 104 villages, and the estimated number of inhabitants is about 12,000 souls, over whom our authority has never been practically established. The spear and shield are sometimes used, but all adult males are armed with muskets kept clean and ready for use. The most powerful clans, Khoongchoo, Khoong, Anoo, and Yeasing are called Shendoos, they reside on the higher ranges distant from the river, and pay no revenue; those living towards Tulukmee speak a different language from the southern Khoomees. The Keok collects annually about 608 Rs. as land rent, &c., from the Khoomees. The total amount annually collected from Khcongthas, Mroos, and Khoomees is 2,165 Rupees. The independent Shendoos, called Poelis by the Muneepoorees, occupy the lofty and distant ranges on the eastern bank of the Koladyne, northwards from the mouth of the Sulla Kheong. They are held in great dread both by the Khoomees and other hill people living lower



down. They speak a different language, understood only by a few of the nearest Khoomees with whom they barter cloths and other articles. Several Shendos were slain in an attempt to levy black mail, and within the last 2 years there has been little or no intercourse between them. Being at feud with each other, no accurate information could be obtained of the population or the precise limits of the Shendoo country.

My best endeavours have been directed to carry out the instructions contained in your letter No. 348 of the 12th October, 1859. I was always of opinion that without kindness and conciliatory measures, there was not the slightest chance of my being able to complete the duties entrusted to me in a satisfactory manner. I availed myself of every opportunity to reconcile the people of one village with another with whom they are at feud. Rangkreegree and Kaffa, village chiefs of the same clan, are the only two Khoomees now at feud with each other; this is a blood-feud, and it is not likely it will ever be adjusted till both become better men. There are no other internal feuds among the different clans of Khoomees. For the first two months of my stay in the hills, my proceedings were viewed with apprehensive jealousy by the chiefs Mounghkine, chief of the clan Yeasing who had committed dacoities near the thannah a few years ago, at first objected to my parties surveying near his village, but some months after, finding that all the most influential chiefs had paid their respects to me, he offered no further resistance.

You are well aware that the Khoomees have always avoided any intercourse with the local authorities. Military expeditions had failed in effectually putting down their inroads, for the troops seldom penetrated beyond a short distance from the thannah, the country being most difficult of access. Before the troops reached the villages to be attacked, the robbers received timely notice, and deserted their villages, taking away their families with them. There are no paths, and the hills being covered with lofty forest, no guides would venture to assist in making a search for fear of their lives. We knew nothing definitely of the most distant clans who are separated by language, manners, prejudices of race, and a most difficult hilly country, from the neighbouring population. One of the leading points therefore, to which my attention was directed, was to induce the chiefs to meet me, so as to ascertain from them, how they propose that the system of dacoity and

marauding, which they all practise to a great extent, might be put down. I found it at first most difficult to induce the most powerful chiefs to meet me, and to remove the general dread and distrust that prevailed. At the first conference, to quiet their fears, I fully explained that my intentions were peaceable, and that my object was to survey and make a map of the country. I also explained to them that dacoity would in future be promptly and severely punished, and asked them how they proposed to put a stop to the same, appealing to the oldest chiefs, who seemed to possess considerable influence over the others. Many of them indignantly denied that they were robber chiefs; others were noisy, and put their hands to their sides, to feel they had daggers to defend themselves in case of treachery. After urging all the arguments I could think of, I broke up the conference, advising them to reconsider the subject more at leisure, and to let me know the result hereafter. Some weeks after, Thambway, a chief of one of the largest clans, offered to serve as Frontier Police Sirdar. Considering that our Police stationed at the thannah, is perfectly useless in preventing dacoities or apprehending offenders, unless supported by a large Military force, I brought the subject to your notice, and recommended the chief for employment. The chief object in the plundering expeditions is to obtain slaves. The village attacked is surrounded at night, and generally set on fire, or a volley of muskets is fired into it. The inhabitants, as they leave their burning houses, are seized, the males are speared, and the women and children carried away into slavery. In the distribution of plunder and slaves, they are guided by their own recognised rules. The leader of the expedition receives a double share, the petty leaders a share each, and their followers generally the plunder secured by each individual. Adult males are difficult to manage, and are invariably killed. The captive women and children are employed as domestic servants, and considered valuable property: 200 Rupees is generally demanded as ransom for each captive. During the period of my stay in the Hills, for 4 months, with one exception, the most perfect harmony prevailed between my party and the surrounding chiefs of banditti. For several months previous, the Police had attempted to recover several captives and were unsuccessful; when I was about leaving Tulukmee, at the earnest intercession of their relatives, I obtained all the 12 captives, valued at 2,400 Rupees, through the clan influence of the chiefs, four of whom were, on my re-

commendation, rewarded for their good services. I trust the manner in which I have carried out your instructions to restore confidence amongst the lowland people, whose lives and property were exposed to attack, will meet with your approval.

The work of the current season will include the unfinished portion of the district, from the Bay of Bengal and Lemroo river on the west, to the Yeomadoung range of Hills on the Ava frontier. The Keoks of the two frontier circles, Tandan and Lemroo, have informed me, that in addition to the wild Khengs, there are several villages of Burmese dacoits, (living within their circles paying no revenue, and saying they are subjects of Ava,) who, it is likely, will oppose my proceedings on the frontier.

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*\*Notes on the Tribes of the Eastern Frontier, No. II.—By J. H. O'DONEL, Esq., Revenue Surveyor of Arracan.*

(Communicated by A. GROTE, Esq.)

The Eastern portion of the district from the Yeomadoung to the Lemroo river is mountainous and hilly. The lowlands are situated chiefly on the west of the Lemroo river, and on the east of the same river there is a narrow belt of lowland, 50 miles in length, and from 1 to 4 miles in breadth. The hill tribes living on our eastern frontier are Khyens, Mrookhyens, and Koos.

KHYENS.—The Khyens differ from the Burmese in dress, language and habits: they occupy both banks of the Lemroo river from the Wah Kheong to the Khee Kheong and the low hills west of the Jegaendong range visible from the plains, the valley of the Taroe Kheong and the low hills and plains within the Tandan, Gnacharain, Prwanrhay and Dainboong circles. They are a quiet inoffensive people and number 3,304 souls who pay land revenue and capitation tax to the amount of Rs. 3,883. Several Khyens have settled down as permanent lowland cultivators, where they have been driven to the necessity of cultivating the fields, to avoid the violence and periodical aggressions of the neighbouring wild people; those living on the west of the Lemroo river, consider that broad river as a sufficient protection. The males frequently go almost naked, having a rag fastened by a string in front

\* Extract from a letter to the Commissioner of Arrakan.

of the lower part of the body: occasionally they wear a chang as a cloak to cover the body. The dress of the females consists of a dark blue cotton gown, fastened at the neck and descending to the knees. The faces of the women are all tattooed, and it gives them a singularly hideous appearance: the tattooing commences with a circle in the forehead and a straight line bisects it, extending to the nose: curved lines are made along each cheek, converging towards the chin, where they end in a circle: the outer line forms a curious edging as if the face was covered with a mask. Figures of animals are sometimes tattooed as ornaments; these marks and figures are made by pressing sharp points into the flesh, and filling the punctures with a liquid, prepared from the juice of a tree found in the forests. The operation is so painful, that young girls of 8 or 10 years are obliged to be tied down, their faces remain swollen for a fortnight afterwards. From 5 to 30 Rs. is generally paid for disfiguring the faces of young females.

MROO KHYENS.—The most northern village, occupied by the Mroo Khyens paying revenue, is Sikcharoa, situated 14 miles north of the junction of the Saeng Kheong with the Lemroo river. The Mroo Khyens occupy the valleys of the Wah Kheong, Saeng Kheong, Mau Kheong and that part of the valley of the Lemroo between Peng Kheong and Saeng Kheong. They number 4,020 souls, of whom 37 cultivators pay an annual revenue of Rs. 111. This small revenue is chiefly derived from the sale of bamboos, which are floated down in rafts of 10,000 or more, and sold in the plains at 1 Rupee the hundred. The village of Anoongroa is a refuge for deformed, maimed, and all sick persons labouring under palsy, ulcers, leprosy and other incurable diseases. Some who recover, cultivate for themselves, but in general they are supported by their relatives, who consider them outcasts: they are not allowed to beg, and would on no account receive shelter in any other villages.

The inhabitants of Hytweegree and the villages on the heights near the Mau Kheong pass,\* situated several miles within our frontier, would not render me any assistance or receive presents, being afraid of the barbarous and cruel punishments inflicted by the Burmese. A Burmese official resides at Loong-shai-mroo, 2 days' journey on the Ava side of the boundary range. He collects annually from each of these villages, one male or female slave valued from 50 to 100 Rs. and

\* Kangto, Thonoo, Atareepoong, Okreepoong.



a chang or covering from each house, valued at 1 Rupee. Although they pay readily whatever is demanded from them by the Burmese, they do not hesitate to levy black mail from the few travellers who attempt to pass by this route over the Yeomadoung at Kooeelandong, (5924 feet high,) to purchase cattle from Burmah proper. They did not however offer any opposition to the survey parties employed in this direction. The high central ridge of the Yeomadoung is a distinct natural boundary, and there is no doubt that the villages named above are situated within the limits of the Akyab district.

Koos.—The Koos occupy the mountainous country near the sources of the Lemroo river and its principal feeder the Peng Kheong, within the 22nd parallel of north latitude, westward of the Yeomadoung range; they have never paid any revenue and it is only after entering the hills for 8 or 10 days, that the first villages of these wild people are met with. The approximate number of houses is 2597, and allowing 5 persons for each house, the number of inhabitants may be estimated at about 14,485. Those living on the Peng Kheong have intercourse with the neighbouring Khoomees of the Koladyne circle, from whom they differ but little in their habits. On occasions of rejoicing, the latter amuse themselves by dancing round a bull or gayal tied down to a stake. As they dance round and round the animal is slowly despatched by numberless spear wounds, aimed at every part of its body. Bamboo cups are applied to the wounds; men, women and children drink the blood. Beyond vague information that the Koos exceeded the Khoomees in their barbarous practices, by torturing human creatures in the same manner, nothing was known of them. Revenge may occasionally be gratified in this cruel manner, but the practice is not common, nor could I obtain any information on the subject. The Koos living on the Lemroo river are perfectly wild and at feud with each other. Interpreters and guides from the nearest Mroo Khyen villages could not be obtained; they would not accept of presents, stating that it was as much as their lives were worth, to attempt proceeding higher up the river. Three attempts were however made to proceed a few miles beyond Khopatong hill station; twice the Khyen coolies deserted, and the third time they resolutely refused to proceed, and said they would again desert, if another attempt was made. The direction of the Hill stations was changed more to the westward, and the triangulation was carried on along the heights bordering on the Peng

Kheong. The Koos being unacquainted with the use of salt, their food is extremely insipid and the smallness of their appetite was noticed. Their chief food is Indian corn. Like the Khyens and Mroo Khyens, they wear but little clothing. Canes slit in two and painted red are wrapped round the stomach about 20 times, as a protection from poisonous arrow wounds. Muskets are common amongst the Koos of the Peng Kheong. Spears, bows and arrows, manufactured by themselves, are the other weapons used.

The Khyens made no complaints about any of their villages being attacked by Hill robbers or of any of their number being carried away as slaves. Cattles are, however, frequently stolen.

The only route by which the Hills can be entered, is the bed of the Lemroo river, which, in the upper part of its course, is a mountain torrent, and admits only of canoes of the smallest size. There is a waterfall 4 miles above the village of Goonguen or Lemroo, and after the first day's journey, falls and rapids are met with almost at every mile and sometimes oftener. The principal feeders of the Lemroo are the Peng Kheong, Saeng Kheong, Wap Kheong, Mau Kheong and Saroe Kheong. Canoes are used on these streams for short distances from their junctions with the main stream.

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*Notes on the Tribes of the Eastern Frontier, No. III.—By H. J. REYNOLDS, Esq.*

*(Communicated by A. GROTE, Esq.)*

I have alluded in my 5th para.\* to the existence of several Kookie villages near the boundary line. I was told that there are 18 such villages, and I have myself visited 7 of them, all of which are within the British territory. As these hills have perhaps never before been traversed by an Officer of Government, a few remarks respecting these hill people may not be out of place. I have above spoken of them as Kookies; but the name is not properly applicable to these people, who are an entirely different race from the Kookies of the Chittagong jungles. The name by which they are commonly known is "Tipperahs." In physiognomy some of them are like the Muni-porees, but the greater part bear more resemblance to the Khasiah

\* In a foregoing portion of the letter from which the above is extracted.



tribes, having strongly marked Calmuck, or Mongolian features, with flat faces and thick lips. Those whom I saw were not in general shorter in stature than Bengalis, and were far more muscular and strongly made. I was struck, with the fair complexions of many of them, scarcely darker than a swarthy European. The villages which I visited contained perhaps from 100 to 200 inhabitants each, and each house is raised on bamboo piles 4 or 5 feet from the ground. This is done, as I was told, partly as a protection against wild beasts, and partly to keep the houses out of the reach of floods after a heavy rain; (I may remark, that though I heard a good deal of wild animals being numerous upon these hills, yet I saw none whatever; indeed the hills appeared to be remarkably bare of life, even birds being very scarce.) The "Tipperahs" understand and speak Bengali, the better class of them correctly enough and the lower class imperfectly: but they conversed with each other in a dialect of their own, which none of my party understood. They appear to maintain no caste restrictions, and eat any kind of food; even taking with perfect readiness some which I offered them. They keep pigs, fowls and pigeons, but they do not seem to have any bullocks, nor did I see any ploughs in their villages. They cultivate cotton and rice upon patches of the hills which they clear of jungle. They pay no rent, I was informed, for the lands they occupy; but they pay a nuzzer of one rupee to the Rajah of Tipperah upon every occasion of a marriage among them.

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*Aornos.—By Lt.-Col. J. ABBOTT.*

In the Asiatic Society's Journal No. 1 of 1863 I have lately perused an interesting paper by the Rev. I. Loewenthal upon the antiquities of the Peshawur district, of which I hope to see many more numbers. My object in noticing it at present, is less to support my own theory regarding the site of Aornos, which does not appear to me to be shaken, than to invite attention generally to the subject and others connected with the footsteps of the Greeks; whose coins and sculpture abound in all old sites of the Peshawur district and in a large number of those between the Jelum and Atuk. Not only is this ground classical to us Europeans; it is also the classical soil of the Hindoo—the Eusufzye and the valley of Sohaut containing many of the old sites spoken of in the heroic poems of that race.

At page 13 of Mr. Loewenthal's essay he calls in question the locality I have assigned for Aornos, upon the verdict of some great Military authority (unknown) because "the Mahabunn commands nothing, and is so much out of the way, that it could hardly ever have been a place of refuge for the people of the plains, and if it had been, a general like Alexander would not have wasted his time on the reduction of an isolated hill which was by no means impeding his passage to the Indus."

Now at first sight all this may appear to be sound argument. It is only when we find that not a single position agrees with fact, that we regret the rashness of great Military authorities, in deciding, without investigation, questions so perplexing as this.

First, it is stated, that the Mahabunn commands nothing.

I answer, that it commands the liberties of the most warlike of the tribes in the Peshawur valley; the Aspasioi, or Asupzye, as they still term themselves. So long as Aornos was free, the Aspasioi could not be conquered. And as long as the Mahabunn is free, the Asupzye can never be subdued. Their villages may be occupied at great expense by armed garrisons: but sooner or later those garrisons will be cut off, and the people will reassert their freedom. It was this certainty, (in all probability,) which led Hercules four thousand years ago to assail Aornos. And it was possibly the same assurance, that, (after an interval of 2000 years,) conspiring with his emulation of the heroes of antiquity, prompted Alexander to the same undertaking with better success.

Secondly, it is asserted that the Mahabunn "is too far out of the way to have been a refuge to the people of the plains." But this is contrary to fact; for the Mahabunn, which includes a vast tract of forest-belted mountain, ever has been, as it still is, and always must be, the retreat to which the Aspasioi (Asupzye) when invaded, drive their flocks and herds and carry their women and children: its very distance, (to an invader, for it is not very distant for them) forming one of the especial reasons for its selection. Not only did Hercules and Alexander (if the Mahabunn be Aornos) find it necessary to assail this stupendous mountain, but Nadir Shah himself could not reduce the Eusufzye to submission, until he had crowned the summit with his army. Hercules (we learn from Curtius and Diodoros) made earthquakes and heavenly portents his plea for abandoning the siege. His real reason, probably, was that, less provident than the son of Philip, he found his supplies cut off and the prosecution of the siege impossible. It is *because* the Mahabunn is the immemorial retreat of the Aspasioi of the plains when overmatched, that I was first led to enquire whether it might not be Aornos.

Thirdly, it is objected, that "had the Mahabunn been the refuge of the people of the plains, a General like Alexander would not have wasted his time on the reduction of an isolated hill, which was by no means impeding his passage to the Indus."

Had it been said "a General like Napoleon or Wellington or Marlborough," the rashness of this remark had been less obvious. But Alexander differed from all other great generals in this, that his love of conquest was rivalled by his ambition to excel the heroes and demigods of antiquity. Neither Napoleon nor Marlborough nor Wellington, probably, would have headed the forlorn hope in storming like a common grenadier a mud-walled town, which any of his Captains could have reduced in a week. Yet we are obliged to believe that Alexander did this; nor can we well believe that he attacked Aornos, without crediting what all his biographers assign as his reason, that it had resisted three assaults of Hercules. We must, moreover, remember that Alexander was already in possession of the Ferry of the Indus. He awaited the construction of boats, of which the timber\* must be

\* Ἐπεὶ δὲ καὶ ὅλη ἔργασίμῳ ἐνέτυχε παρὰ τὸν ποταμὸν, καὶ αὕτη ἐκόπη αὐτῷ ὑπὸ τῆς στρατίης καὶ ναῦς ἐποίησαν. Arrian iv. 30.

felled in the Mahābunn, ere he could cross. He was not, therefore (as our great Military authority supposed,) in any hurry to approach the Indus; but was steadily conquering the country of the Asufzye and the valley of Swat, conquering in order to retain possession, not merely to ravage and destroy. So that although it might have flattered his pride to dispute with Hercules the prize of valour, it was quite reconcileable with his prudence to reduce *that* stronghold, without which the Asupzye could never be effectually subdued.

Unless greatly mistaken, we have fully answered all the objections of the unknown Military authority. We now come to Mr. Loewenthal's reasons for thinking that the castle of Hodi near Atuk on the farther brink of the Indus is the veritable Aornos.

The unknown authority already quoted goes on to say, "The hill above Khyrabad is not only a most conspicuous point for friend and foe, but also one that must be taken before a passage of the Indus at Atuk would be attempted by an invading force."

The castle of Hodi is conspicuous enough; it occupies the summit of a hill about 600 feet high, standing on the river's brink about a mile below the crossing. But as, according to Mr. Loewenthal's account, it could be entered only from the river side, a very small force would have sufficed to keep its garrison prisoners to their castle. And I must deny that any garrison, armed with spear, sword, shield, bow and arrow, could have impeded the crossing of such an army as Alexander's from Hodi's castle. Supposing, however, that this castle was then in existence, (of which there is not the slightest probability,) and that the Asupzye had fled thither from Bazira, Ora and the rest of the cities of the plains, Alexander might probably have deputed Ptolemy or one of his other Captains to reduce it. But we can see nothing in the castle itself, nor in the paltry hill on which it stands, to justify either the repulse of Hercules or the ambition of Alexander to be its captor.

The next supposed point of resemblance is its name. Its veritable name is Raja Hodi ki killa, the castle of Raja Hodi, and it has no other. But as Atuk is often called Benares Atuk, just as Chuch is called Chuch Benares, Mr. Loewenthal assumes that Raja Hodi's castle may have been called Benares, in order that it may be reduced, first to Varanas and from thence to Aornos. We think that such a chain of suppositions will scarcely answer to identify the contemptible hill

in question with the magnificent mountain described as Aornos. That the ancient name of the purgunna or tract on which Atuk rests was Benares is probable enough; but it seems to me that this Benares (whether city or tract) must have been on the same side of the river as Chuch, which to this day is called Chuch Benares. For the breadth of the Indus there, (upwards of two miles,) completely severs Chuch from the Eusufzye, and when Alexander visited them, he found them subject to two distinct sovereigns.

The name is variously pronounced as Bunnarr, Bunares, Bunass, the latter signifying "destruction."

We think it may serve an important end in the elucidation of this knotty question to record all the different accounts now extant of Aornos. Persons who do not possess the ancient authors treating upon the subject, may then visit the various possible sites and judge for themselves which was the tremendous rock that repulsed three attacks of Hercules, the greatest General of his age.

To begin with Arrian, who, in spite of Mr. Loewenthal's disparaging remarks, has left us one of the most succinct and detailed accounts ever penned, of this campaign, Aornos was a table mountain 14 miles in circuit at base, 4125 feet in height, extremely steep, having abundant water at the summit and numerous welling springs, plenty of wood, and soil for 1000 ploughs (should it be tilled). It was the refuge of all the cities of the plains, but especially of Bazira (Bajra) and Ora, (perhaps Ooud or Owra). The ascent to it was from Umb, Balima, (sites retaining this name at the foot of the Mahabunn). Although so steep, Alexander led up it a squadron of the companion horse, 20 mounted archers and his engines of war. Though the rock held by the enemy was so lofty, yet the mountain had still higher ground, which Ptolemy got possession of by the aid of a spy, attacking thence the enemy in rear. Alexander met none but natural obstacles, until he had ascended the mountain after 6 days' toil and incessant hand-to-hand combat. He then apparently reached a table summit, having soil, in which he dug his trench and raised his parapet of approach. Near the rock was a mound of equal height, which the Macedonians carried by assault. After which the garrison lost heart, and when Alexander withdrew his pickets, vacated the place by night. The rock on the table summit must of course have had parapets, or the enemy could not have held it an hour after Alexander's attainment of the table summit. But it was



not in itself very formidable, for Alexander and his companions scrambled up it without waiting for ladders.

This is the account of Arrian, generally the most faithful of historians. It has all the appearance of having been copied from the journal of an eye-witness : perhaps Ptolemy, perhaps Beton, Alexander's quartermaster, whose journal was published. According to him the difficulty of the enterprize was the exceeding courage of the defenders opposing Alexander on a very steep acclivity, which he was 6 days in surmounting. But walls or ditches are nowhere mentioned. The fidelity of the people in concealing from him the path by which such a wilderness of mountain might be safely entered, was amongst the foremost difficulties. A foreigner who had long resided there was his guide, bribed by a large sum\* of money. This is Arrian's account, and should any one have to attack the Mahabunn, Arrian would serve him as a guide step by step.

We next come to Strabo's very meagre notice of Aornos. "Alexander had taken, in the first assault, a certain rock called Aornos, whose roots the Indus, not far from its springs, washes."

Next follows Curtius, whose account is so diametrically opposite to that of Arrian, that it is necessary to choose the one and reject the other. I am not singular in siding with Arrian, whose detailed narrative is as sober as Curtius' is wild and inflated. Curtius describes the rock Aornos as having the figure of a goal, terminating above in a sharp pinnacle, its roots being entered by the river Indus, scarped on both sides by lofty rocks. On the other hand were interposed gulfs and quagmires, which Alexander filled, by felling and casting in a forest ; a work of 7 days. The assailants who were repulsed, fell into the Indus, as the garrison rolled down upon them rocky fragments. The repulse was signal, but as Alexander showed no symptom of abandoning the siege, the Indians after a while evacuated the rock. This rock was near Ora and one march from Ek-bolima, beyond which was a defile : after which he reached the Indus in 16 marches, and found all prepared for crossing.

No mention is made of walls to this Fort. In fact, supposing it to have had the figure of a Roman goal as above described, walls had been utterly superfluous, and its name of Aornos had been well deserved.

\* 80 Talents.

Diodoros' account is as follows. Aornos was the refuge of the people of the plains. (The loss of a portion of the narrative prevents our knowing the names of the cities from which the garrison had fled.) It was excessively steep; and Hercules had desisted from the siege, owing to earthquakes and heavenly portents. This rock had a circuit of  $8\frac{1}{2}$  miles, an elevation of 10,560 feet and its surface was every where smooth and taper; being washed at the South by the river Indus. Elsewhere it was girt with deep ravines and was difficult with precipices. A foreigner of destitute circumstances led him to a post which gave him the upper hand of the garrison, and commanded its only outlet. Alexander therefore, having blockaded the rock, filled with earth its chasm and roots and pressed the siege incessantly 7 days and 7 nights: when, conjecturing that the garrison had lost heart, he withdrew his guard from the outlet, and the barbarians evacuated the rock by night.

Several points in this account agree with that of Curtius, who probably took much of his narrative from Diodoros. All three agree in one fact, however they may differ in others; viz. that Aornos was fortified by nature alone and not by human art. Whatever therefore the site to be considered, it must be one, almost impregnable by nature if well defended, and destitute of artificial defences, excepting of course that rude parapet of loose stones or earth, which barbarous nations from the earliest days have employed. Diodoros makes no mention of the assailants being hurled into the Indus. This appears to be a pure invention of Curtius, deduced from the fact that the Indus washes the roots of the mountain. Arrian's and Diodoros's accounts do not differ very materially, if we consider the six days' ascent of the mountain (so circumstantially described by Arrian,) and the ambush of Ptolemy to be embraced by Diodoros in his brief statement, that a foreigner for reward led Alexander where he commanded the only access to the rock. To Curtius, generalship was nothing: courage and dash every thing. The mountain up which Alexander, with consummate skill, fought step by step for six days, was far too prosaic for his page. He makes it rise out of the river like a Roman goal and then he makes Alexander fell forests to build a ramp up to the summit. All of a sudden we stumble upon Diodoros, who estimates its perpendicular height at 10,000 feet or 2 miles; and then we wonder whence forests could be had sufficient for the work, or hands to fell and pile them up in six days.

We know of no other ancient accounts of Aornos beside those just now quoted. When Plutarch wrote, there were 16 different histories of Alexander's exploits, every one of which has perished. Plutarch himself offers no account of this siege, excepting the words of encouragement which Alexander offered to a leader of one of the storming parties of his own name. We have therefore, I believe, collated together all that is authentic relating to Aornos.

From these it appears that in our search for Aornos the following particulars must absolutely be borne in mind ; two of the three authorities agreeing together in all.

That Aornos was on the right bank of the Indus, near the cities Masaga, Oora, Bazira and Em-bolima.

That it was the place of refuge of the dense population of the plains, including that of the cities aforesaid.

That its defences were not artificial but natural.

That its perpendicular height was very considerable, being rated by one historian at 10,000 feet, by the other at 4,000.

That it abounded in forest.

That, high as stood the rock itself, the mountain which it crowned had yet higher ground.

That when the mountain summit had been won, and the rock confronted, the extraordinary danger to the besiegers was past.

Now, in considering Hodi's hill,—if it be the Aornos we are seeking, all the fortifications which now render it formidable must have been built since Alexander's day ; and therefore we must imagine the hill stript of them before asking whether this be Aornos. Would Mr. Loewenthal really believe that one born and nurtured amongst the wild mountains of Macedonia, who had stormed Tyre, carried some tremendous natural strongholds in Bactria and in the Buktari mountains, and had just crossed twice the Hindu Koosh, with all his engines of war, would have felt much piqued by the fame of a hill some six or seven hundred feet high, little differing from thousands around him,—a hill, too, which from the river side at least (for I have a faithful sketch of it from Attok) is perfectly accessible from base to summit.

If this hill be Aornos, we have also to discover south of the Loondi or Cabul river, sites answering to the cities Bazira, Oora, Masaga and Embolima. For fugitives from the Eusufzye could not have fled to

the hill of Hodi's castle ; being intercepted by the strong column under Craterus, marching from Peshawur direct to Atuk, to prepare boats for the transit across the Indus. This column, on its way, took and fortified the city Orobatis on the Northern side of the Loondi. This city I discovered in ruins, under the name Arabutt. The sites Bajra, Ooria, Moosagurh, Umb-balimah near the roots of Mahabunn answer well to the sites that must be found near Aornos, but I have heard of none such being discovered\* near Atuk.

Thus then stands the case, Raja Hodi's hill is recommended as being near the main ferry of the Indus, and on the river's brink where scarped with abrupt rocks, although no man struck down in ascending it, could possibly fall into the Indus as Curtius supposes they fell from Aornos.

It is liable to objection, as not being near Embolima, Oora, Bazira, or Massaga. As not being suited to shelter the people of the plains or their cattle, having no grass and little water, and being within an hour's march of the main road. Its only known name cannot by any ingenuity be converted into Aornos. It does not in the slightest degree resemble a Roman goal, being perfectly accessible from base to summit on the river face. Its height is not a fourth of that reckoned by Arrian, nor a tenth of the height assigned to Aornos by Diodoros. Being visible from base to summit from Atuk, Alexander could never have required a guide at an expenditure of 80 talents, to show him the road up. It has at summit no ground on which the 220 Horse which accompanied Alexander up Aornos could act. Nor can we imagine any reason why it should be called the Rock, being no more formidable, no *less* accessible than thousands of scrubby hills of like figure scattered all over Asia.

When (according to Arrian,) the fortified hill city Bazira had been evacuated by its defenders, who fled with others of the plains for refuge to Aornos, and when Alexander, fired with emulation of his great ancestor Hercules, had determined upon attacking that rock ; he established garrisons in the cities Ora and Massaga, and secured with a wall the city Bazira. Meanwhile Hephaistioon and Perdikkas, whom he had despatched from Nikaia, (Jullalabad,) direct to Peshawur and the river Indus, walled and garrisoned Orobatis (Arabutt on north bank of Loondi) and reached the Indus to prepare boats for

\* There is a Bazaar, not very far from the Loondi river, but it is on a flat and Bajira was built on a hill, &c.



the passage across. Alexander, who had come through the country of the Aspasioi (Issupzye) and Gouraioi and Assakanoi,\* (people of Punjgour and Swaut,) to Bazira, leaving this town, and subduing some others on the Indus, came to Embolima at the foot of Aornos.

Had Alexander marched towards Atuk where Hodi's hill is sited, he had not sent half his army† with Hephaistioon and Perdikkas, as he would have been himself close in rear to support them. But he had gone through the countries of the Punjgour, the Assazye and Asup or Issupzye, and rejoined Hephaistioon after the siege of Aornos by a march of‡ 16 stages: proving manifestly that Aornos was no where near the crossing of the Indus.

Were Raja Hodi's hill, when divested of its fortifications, a stronghold calculated to have thrice foiled the greatest General of his age, and to be regarded as the greatest capture of Alexander; it would be time enough I think, to enquire whether its name had ever been Benares or any thing else convertible by etymologists into Aornos.

Mountains quite worthy of Hereules and of Alexander overshadow the Indus above the plain of the Aspasioi. Whether Mount Wunj (Aonj) the most difficult of these, and which, according to tradition, was not violated even by Alexander, be Aornos, or whether it be the Mahabunn, which more exactly suits Arrian's description, I must leave to be determined by after research. In the case of the Mahabunn the name alone differs. Its title of "The Rock" it well deserves, as seen from the river side, being searped by tremendous precipices at summit: and its name of "Mahabunn" or the mighty forest, may very possibly be a corruption of "Mahabutt," the mighty rock; even as we know from Jehangir's autobiography, the neighbouring mountain of Gundgurlh, to have been called in his day§ Gurrjgurh or "the house of Thunder," and Huzara to have been called "Abisara."

Persons who first visit Atuk, look up at once to Hodi's castle and if they have not Arrian beside them, naturally ask, may not that be Aornos? But after considering the contemptible nature of the hill,

\* Assakanoi are no doubt the Assazye or sons of Assa who inhabit Swaut.

† *εχοντας την τε Γοργίου ταξιν και Κλειτου και Μελεαγρου και των εταιρων ιππεων τους ημισεας, και τους μισθοφορους ιππεις συμπαντας.* Arrian iv. 22.

‡ Inde proecessit Ekbolima, &c. Hinc ad flumen Indum sextis decimis eastris pervenit. Curtius VIII. 12, i. e., to the crossing of the Indus. For he had just descended Aornos which is on the Indus.

§ From the thunderous sound which seems at times to proceed from its summit, but is probably the reflection of a sound generated high up in the river channel.



and comparing it with the stupendous mountains overshadowing the Indus, forty miles higher, they wonder that they should ever have entertained the idea.

Those who would wish to see the subject discussed at length, I beg to refer to my paper in the XXIII Vol. of the Asiatic Society's Journal, entitled "Gradus ad Aornon."\*

I beg to take this opportunity of correcting the following note which occurs in the paper aforesaid. It relates to my rendering of a passage of Curtius.

"*Note.* This passage 'Hanc (*i. e.* petram) ab Hercule frustra obsessam esse, terræque motu coactum absistere fama vulgaverat' is obscure: the word *coactum* agreeing neither with *Hercule*, nor with *petram*. I would suggest its being read '*coactam*,' which reconciles the difficulty: and after consideration I have adopted this reading. Our respect for *Hercules* would not improve, could we think him one to have been terrified by an earthquake."

When the above was written I had not consulted *Diodoros*, which now lies before me. He repeats the tradition in better grammar.

λέγεται γὰρ τον παλαιὸν Ἡρακλέα ταύτην τὴν πέτραν ἐπιβαλόμενον πολιορκεῖν ἀποστῆναι διὰ τινος ἐπιγενομένου μεγάλου σεισμοῦ καὶ διόσσημείας. Lib. XVII. πε.

Now *Hercules* might have been a very stout fellow and have knocked out other men's brains without boasting any of his own. But he could not have been the great conqueror which his deeds attest, had not his wit been in proportion to his strength and courage. We think he was far too shrewd a fellow to be outwitted or bullied by an earthquake. And therefore, if he made this his plea for raising the siege of *Aornos*, it was, in all probability, because his supplies had been cut off, (an easy matter in the *Mahabunn*,) and he was ashamed to own his improvidence. *Alexander*, (see *Arrian*,) did not attempt the siege until he had appointed *Krateros* to collect corn for the army into the town *Embolima*.

Of the name *Aornos*, I do not think it certain, as does *Mr. Loewenthal*, that it is Sanscrit. It was the second rock of that name and description which *Alexander* had taken: the first being in *Bactria* beyond the *Hindoo Koosh* and out of reach of the Sanscrit tongue. Its meaning in Greek is "unwinged" as if challeng-

[\* The map there given will be found useful for the present article.—Ed.]

ing all unwinged things. If, however, it be not Greek, it is not necessarily Sanscrit, for we have undoubted proof that the Pushtoo language was in use at that time in that region, and that the Afghan race held the region to which Aornos appertains. It might therefore be either a Pushtoo, or a Sanscrit, or an Aboriginal, or a Persian word.

There are several Hindi names of Forts which would have been rendered by the Greeks Aornos,—Urniya or the unapproachable, Woorna, Awur, Aonj or Wunj. The first of these, (now called Kotta,) stands at Umb Balimah (Embolimah,) and so overhangs the Indus on its eastern face, that water is ordinarily drawn up from the Indus by the garrison. But this rock, like Hodi's hill, is too contemptible to be the Aornos of history.

When first I approached the Indus at Torbaila, I felt that I was in presence of the veritable Aornos. And on discovering that the mountain rising like a green wall to the height of 3000 feet above the water, bore the name of Wunj or Aonj which the Greeks would have written Aornos, I deemed it almost certain that this particular rock was the stronghold in request. It was only when I learnt that Mount Aonj has no arable land and little water, so that although quite inaccessible against sudden invasion, it cannot hold out long; and that the Mahabunn, which has abundance of water, grass, firewood and arable land, is the ordinary refuge of the Eusufzyes of the plains with their families and cattle, that I was obliged to prefer the Mahabunn, a spur of which falls sheer into the Indus.

The Mahabunn itself, however, is invisible from the western brink of the Indus, being concealed behind Mount Aonj. The Greeks therefore might easily have confounded the two and have thought they were ascending the mountain pointed out to them as Aonj or Aornos.

From the junction of the Burrendor torrent (flowing out of Boonair) with the Indus, down to Atuk, the river margin has been most carefully searched, but although it seems improbable that Aornos should be below Atuk, this should not be left in doubt. The river's bank should be explored, as opportunity offers, down to Neeláb at least, bearing in mind that it is not a castle we must seek for, but a stupendous rock or mountain to which the people of the plains flee for refuge.

It is difficult to understand why Mr. Loewenthal supposes the author of the "*Gradus ad Aornon*" to have followed Curtius rather

than Arrian, in spite of the contrary assurance, given at the outset of that paper and carefully maintained throughout.

Although ourselves satisfied that the Mahabunn is the Aornos of history, we think the question quite open to discussion. We believe that the epithet of "rock" given to what Arrian's account clearly defines to have been an immense table mountain, has been the great difficulty hitherto in the search. Curtius' imagination immediately depicted it, as an obelisk of rock rising out of the Indus: and being more popular than Arrian, he has led many astray. But Arrian's account so distinctly lays down which part of the river to search for Aornos, viz., the neighbourhood of Umb Balimah, Bajra, Oora and Moosagurh, that the mountain in their neighbourhood forming the ordinary refuge of the Eusufzye, abounding in springs, grass, wood, and arable land, must needs be Aornos. And excepting the Mahabunn, which can turn out 12,000 matchlockmen, there is no such mountain on the right bank of the Indus.

Hitherto no British traveller has passed up the Indus higher than Umb, and to search higher for Aornos would be to no purpose, because no mountain higher up could have been the refuge of the Asupzye. But in cross-questioning native travellers, I discovered that there exists a white rock, (perhaps of milky quartz) on the right bank of the Indus, in the river basin, about fifty miles above Umb, called to this day "Tehitta Butt Kephale Bous." The first two words in the Punjaub dialect signifying "the white rock" and the two latter being manifestly Greek, signifying the "Bull's Head," which was also the name of Alexander's celebrated charger. So far as I can learn, there is no longer any carving on the rock; but it seems not improbable that there may have been a basso-relievo of Boukephalon in former days. The bigotry of the Muhummadans causes them to deface all sculptured figures of men or animals. It is the only instance I have discovered of a Greek name in a country abounding in coins bearing Greek Inscriptions. I mention this not as connected with Aornos but in order that it may be borne in mind by persons making enquiries in that corner of the Punjaub. During the eight years I was employed in Huzara, I was too much overworked to take even one week's leave of absence for the purpose of exploring.

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*Remarks on the Taxila Inscription—By Professor J. DOWSON,  
Sandhurst College.*

[The following is a letter addressed to E. Thomas, Esq., the Society's Honorary Agent in London, and by him communicated to the Society.]

*Sandhurst, 15th September, 1863.*

MY DEAR SIR,—I am much indebted to you for so promptly sending to me General Cunningham's paper on the Taxila Inscription, and I very willingly adopt your suggestion of sending the few remarks I have to make upon it for insertion in the Journal of the Asiatic Society of Bengal. The discussion upon it will thus be greatly facilitated and more speedily brought to a conclusion.

The call which you sent to India, before my translation was published, for a separate independent version of this important record, was at once responded to by General Cunningham. Both translations are now before the world, and although there are many points of difference between them, there is quite sufficient of agreement, to satisfy even the most sceptical, that we are working upon a sure foundation. I perceive that General Cunningham has discovered the two slightly varying forms of the prefixed *r*, he has also made out the diverging form of the letter *y* as it appears in the Wardak Urn Inscription, with a rounded instead of the usual pointed head. We have thus simultaneously arrived at these decipherments, and I am happy to have my name associated with his as their godfather. Other identifications which I proposed will I hope recommend themselves to his approval, such as the *tt*, the compounds *han*, *mam*, *yan*, *s'wa*, &c.

Your announcement of my discovery of the true values of the Bactrian numerals has at once been adopted, and General Cunningham has gone through the various Bactrian dates, with results entirely in accordance with my own. In one instance, that of the Ohind Inscription, he has amended the old reading of the date, by changing the unintelligible word *vaomiti* into *attamiti*. I proposed this emendation, but having only the lithograph before me, I did not venture upon making it. He has doubtless consulted the original document or independent copies. We thus get another confirmation of the value of the two crosses forming the number 8.

I have gone most attentively through General Cunningham's translation, and after duly considering all the points of difference between

his reading and my own, I in every instance prefer my own transliteration. In his laudable desire to prepare an entirely independent version, he was necessarily hurried, and was unable to bestow upon the Inscription the same amount of attention and study as it received from me. I am sanguine therefore as to the probability of his acquiescing in most if not in all of my readings, and that eventually our differences both of transliteration and interpretation will be reduced to a minimum.

It is not my intention to minutely compare our readings, or to comment upon all the differences. Any passages in my version which may be impugned, I shall be ready to defend, or frankly surrender when the time comes; but there are a few points of difference which are of some importance, and deserve notice, one especially in which General Cunningham's version enables me to improve my own translation.

First as to the transliteration. The compound character which I have rendered *tt*, General Cunningham has made to be *th* in the date and in the Ohind date. The same character really appears again in the third line, in the word which I have read *aprat̐itavita*, but the copy published in this Journal is defective in this instance, having *v* instead of *tt*. This blemish in the copy renders necessary a revision of General Cunningham's reading, and I doubt not that he will accept my version. General Cunningham corrects the word *prachu* (east) into *pa-cham* (west), because Hussun Abdal, the place where the plate was found, is N. W. not N. E. of Taxila. I cannot, however, assent to this alteration. The letters of this word are as perfect and distinct as any in the whole Inscription, and they form most unequivocally the word *prachu*. This may be a blunder, but it is just as possible that it may admit of explanation. The plate was "found" at Hussun Abdal but we are not sufficiently acquainted with the facts of its discovery, to justify us in a positive assumption of its having been originally deposited there. However this may be, it is surely better to transcribe the word as it stands, and if it be an error, to prove it so. The one course decides the matter, whether rightly or wrongly; the other leaves it open to discussion and to the light of future discoveries. The next point of difference which requires notice, is the words which I read "*sangharamam cha*," but in which General Cunningham finds "*Sangha Rachite (na)*" and understands them as forming the name of the person who deposited the relic. We agree in the word "*Sangha*"



but I unhesitatingly reject the reading "*Rachite (na)*". The first letter is certainly *r*, but it is completely eurl'd round at the point in a way that I have supposed to represent the vowel *i* in the word *Chhatrapasi*. There is this difference, however, between the two words; both occur twice, but while the eurl'd point is distinctly repeated in the *s* it is not so in the *r*. In the short line at the foot, the word is clearly written "*sangharamē*." This leads me to believe that the eurl of the *r* in this passage is simply an exaggeration. The next character is "*mam*." General Cunningham has failed to recognize the *anuswara* here, like as he has failed to observe it as subjoined to the *h* in the word *mahantasa*. For these reasons I hold to the reading "*sangharam cha*," taking the final syllable of the first word to represent a Gen. pl. I may also add, that it seems clear to my mind, that Liako Kusuluko himself, and no other person, performed the deed which the Inscription commemorates. There are other minor points of difference in the transliteration which may be passed over at present, I will only remark that the final letters of the body of the Inscription which General Cunningham has passed over as illegible, and which I have read as *uvajae*, are perhaps better brought out in the copy sent to India than in the lithograph published at home. They are at best only doubtful, and my reading can only be looked upon as plausible.

Babu Rajendra Lal has already suggested some emendations of General Cunningham's translation which bring it more into conformity with my own. Thus, he proposes *pújá*, instead of *puñya*, as the equivalent of *puyaye*; and he is disposed to reject the idea of *ayu-bala-vardhia*\* being a name. With the analogies of *raya* for *rájá* and *Kuyula* for *Kujula* it is needless to argue in favour of *pújá* being the right word. It may, however, be observed that *puñña* not *puya* is the Prakrit and Pali form of *puñya*. This emendation will require that the rendering of *sarva-buddhána* should be changed from "all Buddhists" into "all the Buddhas" as I translated it, and which seems in every way preferable.

I will now proceed to notice that portion of General Cunningham's rendering which I consider more accurate than my own. It is the beginning of the Inscription, where he refers the phrase "*claye*

\* The final of this word is clearly *a* not *ka*. The lithograph of this Journal is inferior to the home one in this spot.

*purvaye*” to the date, and not, as I did, to the general context. This leaves the words “*Chhahara* and *Chukhsa*” free to represent the names of those districts of which Liako Kusuluko was Satrap. In the first instance I was inclined to look upon this phrase as the equivalent of the Sans. *etat-pūrve* “before this,” and could this rendering have been made consistent with grammar, it might have been worked in; for the Inscription speaks of the erection of the building in the past, and the deposit of the relic in the present. I had no knowledge of the same or similar phrases having been met with in other Inscriptions, and not seeing how to connect the words with the date, I very dubiously rendered them as signifying “in the presence.” General Cunningham says he has found the same words in an Inscription which he has lately discovered at Sravasti,\* and that a similar phrase occurs in the Mathura Inscription. These, however, remain unpublished, and the only other records in which the phrase is used, are the Grants of King Hastin and the Inscriptions of Erikaina, which were published in this Journal in 1861 by Professor Fitz-Edward Hall, and which unfortunately had not come under my notice when I made my translation. The interpretation which Professor Hall put forth, in his very careful reproduction and translation of these Inscriptions, has been adopted by General Cunningham, and he accordingly translates the expression *etaye purvaye* as “on this aforesaid date.” The true meaning of *pūrva* is “first, prior,” and if two dates were given it would refer to the first of them. The word might possibly have the sense of *pūrvokta*, “aforesaid,” but I cannot admit this to be its meaning in the Inscription before us. It is not credible that a document of such remarkable conciseness and brevity, should, immediately after the date and without the intervention of a single word, employ the needless tautology “on this aforesaid date.” The same observation is applicable to the equivalent phrase in Professor Hall’s Inscriptions. In every instance it is used in immediate connection with the date—never in the middle or towards the end of the record, where such a form of words as “on the aforesaid date” might be required to obviate ambiguity. A careful consideration of all the passages in which the

\* He also reads it immediately after the date in the Manikyala Inscription. The word *pūrva* is most probably there, as I have pointed out; but we are hardly justified in reading “*etaye purvaye*.” The first and last letters are distinct in my tracings—they are certainly different from the *e* of which we have an example at the end of the first line.

expression occurs fully confirms the justice of this general criticism, and convinces me that the true signification has yet to be discovered.

The following are the passages in which the words are found :—

Grants of King Hastin—No. 1. षट्पञ्चाशेत्तरेऽब्दशते गुप्तपरराज्यभुक्तौ महावैशाखसांवत्सरे कार्तिकमासे शुक्लपक्षद्वितीयायामस्यां दिवसपूर्वायां ।

2. विषष्ट्युत्तरेऽब्दशते गुप्तपरराज्यभुक्ते महाश्वशुजसांवत्सरे चैत्रमासे शुक्लपक्षद्वितीयायामस्यां दिवसपूर्वायां ।

Erikaina Inscriptions—No. 1. शते पञ्चषष्ट्यधिके वर्षाणां भूपतौ च बुधगुप्ते आषाढमासशुक्लद्वादश्यां सुरगुरोर्दिवसे संसुरभु कालिन्दीनर्मदयोर्मध्यं पालयति लोकपालगुणैर्जगति महारुद्रश्रियमनुभवति सुरसिचन्द्रे च अस्यां संवत्सरमास-दिवसपूर्वायां ।

2. वर्षे प्रथमे ष्ठिर्वीं ष्ठ्युक्तीं ष्ठ्युत्तौ महाराजाधिराजश्रीतो रमाणे प्रशासति फाल्गुनदिवसे दशमे इत्येवं राज्यवर्षमासदिनैः एतस्यां पूर्व्यासे खलक्षणैरुक्त-पूर्वायां ।

The phrase *divasa-purváyám* in the first of these was translated by the late Professor Wilson, “in the forepart of the day.” Professor Hall in the first instance adopted this interpretation, though objecting to the original phrase “as illegitimate Sanskrit in this sense.” Subsequently he altered it, saying “a re-perusal of the Eran Inscriptions has taught me to unlock this quaint and antiquated expression. Understanding *tithyám* I would construe, not over literally, ‘on that i. e. the *aforsaid* lunar day, and on the day of the week therewith coincident.’” In the second Erikaina Inscription, the phrase apparently differs, being, as above quoted, *púrvayáme*. This however is a supposititious restoration of Professor Hall’s, who says, in respect of the final syllable, “here there is an erasure where I propose *me* until ingenuity shall improve upon it.” This phrase he translates “during the first watch of the said lunar day;” but this is inadmissible. *Eta-syám* is a locative and cannot be thus construed as a genitive. The phrase is the manifest parallel of the “*asyám púrváyám*” of the other Inscriptions. The inserted final *e* should therefore be struck out, and with it the meaning of “watch of the day.” Professor Hall’s idea of the word *tithyám* being understood is very ingenious, but it will not, I think, bear the test of a rigid scrutiny. In the first two of the passages above quoted the expression is “*divasa-púrváyám*,” in the third it runs “*samvatsara-mása-divasa-púrváyám*.” These are both compounds, agreeing grammatically with the word expressing the date of the month, in which numeral the word *tithyám* is undoubtedly

implied. There is nothing therefore to prevent their being taken together if they can be reasonably connected. If however these phrases apply with the date of the month, to the word *tithyám* understood it can only be as *Bahuvríhi* or descriptive compounds; and it is difficult to see how the words "day," and "year, month and day," can in any way make a descriptive epithet of a *tithi* or "lunar day." Professor Hall's rendering "on that i. e. *the aforesaid lunar day* and on the day of the week therewith coincident" is an amplification which I cannot extract from "*divasa-púrváyám*;" nor can I see my way to his rendering of the longer compound "on that *lunar day* specified with the year, month, and *week day* aforesaid." The last of the above quoted passages gives, at first sight, some support to Professor Hall's theory. Having amended the reading, as above proposed, we have *etasyám púrváyám* which might fairly be taken as applying to *tithyám*, if we could conceive such an expression as "aforesaid" to be required or appropriate. Unfortunately however for the theory, the date does not refer to a *tithi* or lunar day, being expressed in the masculine, "*Phálguna-divase das'ame*," with which, it is obvious the feminine "*etasyám púrváyám*" can have no grammatical agreement. This seems conclusive proof that the expression cannot signify "aforesaid," there being nothing aforesaid with which it agrees.

Again, in our Taxila Inscription, the phrase "*etaye purvaye*," the exact equivalent of "*etasyám púrváyám*," is used after a date which General Cunningham and I have independently concurred in reading as Panæmus, and it is obvious, that the technical *tithi* of Hindu Chronology can have no application to a Macedonian date.

I have entered thus at length into the reasons which induce me to dissent from the proposed interpretation, because I am anxious to arrive at the true solution of the phrase; and because the respect due to the learning of Professor Hall demanded a full statement of the grounds for my dissent from his rendering. What then is the signification of the phrase? The Dictionaries afford no satisfactory information. As an adjective the word *púrva* means "first, prior;" as a feminine noun *púrvá*, it signifies "the East." These significations are clearly inapplicable. We must therefore, if possible, deduce a meaning, consistent with the primitive sense of the word and the context of the passages in which it occurs. After careful consideration of the different sentences I am of opinion that the word is



always used as a noun (feminine), by so taking it, all difficulties of construction are avoided. Keeping in view the primary signification of the adjective, and the repeated use of this word in connection with dates, it may be conjecturally rendered as *first* or *remarkable occasion*. The day to which the phrase is applied may have been made famous by the deed which the Inscription commemorates, but, it may also have been notable for events of which we are necessarily ignorant, such as the birth or accession of the king. The second Erikaina Inscription affords perhaps some slight corroboration of this theory, as it records the building of a temple in the *first* year of the king's reign, possibly the *first* temple he had erected. The same Inscription supplies some little further support in the curious phrases immediately preceding and following the words "*etasyám púrváyám*." Professor Hall transcribes the first passage as above, "*rájya-varsha-mása-dinaih*," but in Prinsep's Lithograph (Journal Vol. VII. p. 632) the last word is clearly *dineh*. He, however, coincides with Professor Hall in transcribing it *dinaih*, i. e. an instrumental plural. This case, however, comes in very awkwardly as is shewn by the translation "*in the year, month, and day of his reign*." The Lexicons afford no countenance to a crude form "*dini*" for "*day*," but if such a form exists, "*dineh*" will be the Genitive singular and the context will read "On this notable occasion of day, month and year in the king's reign (or, of the kingdom)." After this passage, come the words "*swalakshañairuktapúrváyám*"\* which Hall renders "as circumstantiated," but which may signify in accordance with the view now taken "an occasion remarkable for its peculiar incidents." I propose these interpretations as conjectures only, and will readily give them up if better solutions are produced. The phrase "*etasyám púrváyám*" is undoubtedly full of obscurity, and if I have failed in throwing a true light upon it, I must console myself with the recollection that the deep learning of a Wilson failed to elicit its meaning.

To return now to our Taxila Inscription. I propose to amend my translation as follows: "In the year seventy-eight (78) of the great king the great Moga, on the fifth (5) day of the month Panæmus. On this notable occasion, the Satrap of Chhahara and Chukhsa, by name Liako Kusuluko deposits a relic of the Holy S'ákyamuni in the *s'epatiko* (which he had) established in the country called Chhema,

\* The letters *ru* are confessedly very indistinct and open to improvement.



north-east of the city of Taxila, in honour of the great collective body of worshippers and of all the Buddhas; for the honouring of his father and mother; for the long life, strength and prosperity of the Satrap's son and wife; for the honouring of all his brothers and relatives; and for making known his great liberality, fame and success."

General Cunningham proposes to identify Chahara and Chukhsa with Hazára and Chaeh, or "Chach-Hazára" as the twin districts are now designated. The locality is suitable and there is some similarity in the sound of the words, but the identity cannot be considered more than presumptive. A clearer and more valuable identification is proposed in his supposition of the *Moga* of the Taxila Inscription being the same as the *Moa* or *Maua* of the Coins. To support this identification he cites the name of *Gondophares*, which appears on some of the coins as "*Undopherras*." In my former paper I have given reasons for considering the *Yarugasa* and *Yaiüasa* of the coins to be varying forms of the same word, like *dhamikasa* and *dhamiasa*. To this I will now add, in illustration of the way in which the guttural letters are elided, the name by which the Prakrit designates itself, i. e. *Páudam* = *Prakritam*. So far as mere orthography goes, the names may be considered identical. The number and variety of the coins of *Moa* prove him to have been a monarch of considerable power and importance, one from whom an era might well take its rise. For these and the other reasons which General Cunningham has advanced, I am disposed to consider the identification of *Moga* with *Moa* to be all but proved.

General Cunningham's rendering of the Peshawar Vase Inscription as amended in his Postscript at page 172 is identical with my own, save and except the first letter, which is given as *S* instead of *G*. This is a manifest error of the copyist or printer. We get the letter *m* of *ayam* somewhat differently. He perceives a dot after the *y* which he takes to be the *m*; I, however, find the nasal in the curve of the right limb of the *y*. A few passages of the Wardak Vase Inscription have also come under the notice of General Cunningham and he proposes to amend Rajendra Lal's reading "*asansthanana*" in the last line by substituting "*acharyanam*." Not satisfied with the Babu's reading, I somewhat hesitatingly changed it in my version to "*asans'rana*" a word of much the same meaning. Rajendra Lal admitting the General's rendering to be more appropriate, demurs to the accuracy of

the transliteration. I am quite prepared to read the third character as *ry* instead of *s'r*, for as I formerly stated the *r* certainly comes first, and the *s'* is not distinguishable from *y*. The difficulty is in the second character, which is badly formed and somewhat dubious, but I cannot bring myself to recognize in it the letter *ch*. The General says he finds the same word, "*acharyanam*," in the unpublished Sravasti Inscription or I should hesitate in admitting the word to have been so used among the Buddhists.

While on the subject of Inscriptions I take the opportunity of suggesting an emendation of Professor Hall's translation of two important passages in the grants of King Hastin, which will be found in the lines I have above quoted. My observations apply to the words *bhuktau* and *bhukte*. The simple idea conveyed by these words is that of *eating* or *enjoyment*, but out of these the Professor has elaborated the sense of "waste" or "destruction" in order to bring them into conformity with the word "*s'ante*" which is elsewhere similarly used and which he has translated "being extinct."\* He has certainly got an approximation to the sense, though, to adopt his own words upon Professor Wilson's rendering of another passage, he has not, verbally considered, unriddled them aright. The first passage is "*Gupta-nṛipa-rājya-bhuktau*," which he renders "(In the year 156) of the extinction of the sovereignty of the Gupta Kings." Wilson's version was "of the occupation of the kingdom by the Gupta Kings" (Prinsep I. 251-2). This was certainly objectionable, but simply change the word *by* into *of* and all becomes clear. The word *bhuktau* may be taken in its well ascertained sense, and no development or stretching of the signification is required. The true reading of the sentence, as I take it, is "In the year 156 of (my dynasty's) possession of the realm of the Guptas." The second Inscription reads "*Trishat'yuttare 'bdas'ate Gupta-nṛipa-rājya-bhukte*," the noun *bhukti* being changed for the participle *bhukte*, which is made to agree with the date. Professor Hall renders it "163 years after the domination of the Guptas had been laid to rest." According to my view, it should read "In the 163rd year that the realm of the Guptas has been possessed (by my dynasty). It may be considered perhaps that the words *s'ante* and *bhukte*, having been similarly used, must therefore have a similar signification. To meet this view

\* See Kahaun Inscription, Journal for 1861, page 3.

it may be observed, that the words may be brought into pretty close agreement without any violation of the true meaning. *S'ánta* signifies "quieted, humbled." The words "*rájye Skandha-guptasya s'ánte varshe trins'ad-dasaikottaraka-s'atame*" may therefore be rendered "In the year 141 since the kingdom of Skandha Gupta was humbled (by us)" which is much the same as saying that it was taken possession of and occupied. The origin of this difference of translation is palpable. Professor Hall considered the matter from a Gupta point of view, I have looked upon it through the medium of the authors of the Inscriptions, who probably thought more of magnifying themselves than of recording the downfall of a by-gone dynasty.

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PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR AUGUST, 1863.

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A. Grote, Esq., in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received—

1. From Lieut.-Col. R. C. Tytler, a collection comprising specimens of bats, birds, reptiles, and fishes from Port Blair; also some skulls of turtles and two skulls said to be skulls of natives of the Andamans; one of these, coloured with ochre, was found in a native camp and is supposed to be the skull of a chief.

2. From the same, a large black basket prepared by the natives of the Nieobars, and a light-coloured basket made by the aborigines of the Andamans, and used by them as a fishing bag.

3. From His Honor the Lieutenant-Governor of Bengal, a dead Gayal.

4. From A. Galloway, Esq., a stuffed specimen of a crocodile killed by himself.

5. From the Assistant Secretary, Government of India, Foreign Department, two copies of a series of fifty-four photographs, illustrative of the tribes of Central India, taken by Lieut. J. Waterhouse, of the Royal Artillery.

The Chairman stated that Lieutenant Waterhouse had kindly mounted a set of this series and other photographs in their collection in the Society's portfolio.

The thanks of the meeting were voted to Lieutenant Waterhouse.

A communication from Sir Mordaunt Wells intimating his desire to withdraw from the Society was recorded.

The following gentlemen, duly proposed at the last meeting, were balloted for and elected ordinary members :—

Coomar Chundernath Roy and Baboo Bunkim Chunder Chatterjee, B. A.

The following gentlemen were named for ballot as ordinary members of the next meeting :—

Captain F. Norman, Quarter-Master General's Department, proposed by Colonel Strachey and seconded by Mr. Atkinson.

Baboo Shama Churn Sirkar, proposed by Mr. Cowell and seconded by Mr. Bayley.

T. Bruce Lane, Esq., B. C. S., proposed by Captain Lees and seconded by Mr. Grote.

Duncan Stewart, Esq., proposed by Mr. H. F. Blanford and seconded by Mr. Heeley.

The Chairman read to the meeting the following letter from Mr. Cowell resigning the office of Joint Secretary :—

“ A. Grote, Esq., Vice-President, Asiatic Society.

“ Dear Sir,—I beg to tender my resignation of the Secretaryship of the Asiatic Society, as my health, as well as my professorial engagements, entirely preclude my undertaking any longer to hold it.

“ It will be remembered that this is no new idea. I have several times wished to resign, and I now feel an absolute necessity to do so. I am merely sacrificing my health and time uselessly to the Society as well as myself, as my editorial work for the *Bibliotheca Indica* is at a stand-still, from the incessant interruption which the editing of our Journal causes. I believe that more credit would redound to the Society as well as myself from vigorously continuing the *Taittirīya Saṁhitā*. There are many in Europe who are anxious to see this, but the edition must continue at a stand-still so long as the little leisure I can command has to be given to correcting proofs for the Journal.

“ I may remind the Council that I reluctantly accepted the office at the very first, as I knew how difficult it would be to find time for it ; and I have already held it five years and a half, so that I think I may now fairly claim my discharge. I need hardly add that it is from no diminution in my attachment to the Society ; had I more time, I should have been proud to retain the Secretaryship as long as the Society wished.

“ I remain &c.,

“ (Sd.) E. B. COWELL.

“ Calcutta, 30th July, 1863.”



The Chairman observed that he read this letter with very great regret in which he felt sure that the meeting and the Society generally would join. The only set-off against the loss of Mr. Cowell's services as Secretary was the hope held out of greater progress in the publication of the *Black Yajur Veda* in the *Bibliotheca Indica*.

He would move the following resolution, which he thought would have the meeting's countenance :—

That this meeting desires to record its sense of the services rendered by Mr. Cowell as Secretary during an incumbency of five and a half years, and to express its regret at his inability to remain in that office.

The resolution having been put to the vote, was carried unanimously.

Communications were received—

1. From Lieut.-Col. R. C. Tytler, a short description of a new species of *Paradoxurus*.

2. From C. Campbell, Esq. Executive Engineer, Delhi Division, a copy of a memorandum lately submitted to the Punjab Government on the life-sized statues of elephants exhumed in the Delhi palace.

3. From Baboo Gopeenath Sen, Abstracts of the Hourly Meteorological Observations taken at the Surveyor General's Office in May last.

4. From Colonel Tiekell, an account of the Gibbon (*Hylobates lar*), with remarks on its range and habits.

Mr. Blanford read the paper of Colonel Tiekell, and made some comments on the subject of it, which were subsequently confirmed by the Chairman.

Thanks were then accorded to the author and to Mr. Blanford.

#### FOR SEPTEMBER, 1863.

The Monthly General Meeting of the Asiatic Society of Bengal was held on the 2nd instant.

E. C. Bayley, Esq., President, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received—

1. From Colonel Phayre, on the part of Dr. C. Williams, an inscribed tile with Buddhist figure found at Tagoung, similar to those presented by the Colonel in May last.

2. From the Anthropological Society of London, a copy of No. 1 of the *Anthropological Review*, containing the proceedings of the Society.

3. From H. L. Haughton, Esq., five specimens of sea snakes from Hidgelli, viz., *Hydrus Schistosus*, *Hydrus Obscurus*, *Hydrophis Graecilis*, and two species not determined.

4. From Baboo Rajendra Mallika, a dead Emeu.

5. From the Imperial Government of Russia, a copy of the *Bibliorum Codex Sinaiticus*, in four folio volumes, published by the Imperial Government.

The following letter, which was read, accompanied the presentation :—

“ *Londres, le 11 Juillet. 1863.*

“ MONSIEUR,—Le Ministre de l' Instruction publique, d'ordre de sa Majesté l'Empereur, m' a invité à offrir à la Société Asiatique du Bengale à Calcutta un exemplaire du *Codex Sinaiticus*, édité aux frais du Government Imperial par les soins du professeur Tichendorf.

“ Je fais un devoir empressé de vous transmettre cet ouvrage, en vous priant d'agréer l'assurance de ma considération très distinguée.

(Signed) “ BRUNNOW.

“ *Au Secrétaire de la Société Asiatique du Bengale à Calcutta.*”

On a motion made by the President, the thanks of the meeting were unanimously accorded to the Imperial Government of Russia.

A letter from Lieutenant-Colonel H. C. James, intimating his desire to withdraw from the Society, was recorded.

The following gentlemen, duly proposed at the last meeting, were balloted for and elected ordinary members :—

Captain F. Norman, Quarter-Master General's Department ; Baboo Shama Churn Sirkar ; T. Bruce Lane, Esq., B. C. S., and Duncan Stewart, Esq.

The following gentlemen were named for ballot, as ordinary members, at the next meeting :—

T. Martin, Esq., Principal, Civil Engineering College, proposed by Mr. Blanford and seconded by Mr. Atkinson.

Dr. J. Ewart, Professor of Physiology at the Medical College, proposed by Dr. Fayrer, and seconded by Mr. Blanford.

Dr. W. K. Waller, proposed by Mr. Blanford and seconded by Dr. Fayrer.

Moulvie Waheedoon Nubbee Khan Bahadoor, Deputy Magistrate of Sealdah, proposed by Moulvie Abdool Luteef Khan Bahadoor and seconded by the Secretary.

Major Dickens, proposed by Dr. Fayrer and seconded by Mr. Blanford.

The Council reported that they had received a letter from Colonel Thuillier resigning the office of President, and a letter from W. S. Atkinson, Esq., resigning the office of Secretary to the Society. The first mentioned letter they had received in April, but they had deferred acting upon it until the present time, in the hope that after a few months' absence Colonel Thuillier might be enabled to resume his seat as President of the Society, but having lately received an assurance that he had no expectation of returning to Calcutta for several months, they had, in accordance with the provisions of Rule 57, elected Mr. E. C. Bayley to the office of President for the remainder of the current year. This election would be subject to confirmation by the Society at the next meeting.

The Chairman read the letter.

*Calcutta, 15th April, 1863.*

"SIR,—I regret very much that circumstances compel me to leave Calcutta to proceed to the Upper Provinces on duty, and how long I may be absent is quite uncertain. I much fear I shall not be back before the end of the year, if then.

"My health is also so much broken that it is absolutely necessary to have some respite from work, I therefore beg to request the favour of your laying my resignation of the President's chair, to which I was elected at the last annual meeting, before the Council of the Society.

"In giving up this honour, I need hardly say with how much regret I do it. I have tried hard to avoid the alternative of leaving Calcutta, and have put it off to this late date, solely on account of my position in the Society.

I have, &c.

(Signed) "H. L. THUILLIER, *Lt.-Colonel.*

"W. S. ATKINSON, Esq.,

*Secy. Asiatic Society of Bengal."*

The Chairman then read Mr. Atkinson's letter resigning the office of Secretary to the Society :—

“ August 14th.

“ MY DEAR GROTE,—I expect to leave Calcutta within a fortnight and to be absent probably for several months, I shall be much obliged if you will at once lay before the Council my resignation of the office of Secretary.

“ You and our colleagues are aware that I have long intended to take this step on the first occasion when my absence from Calcutta became necessary, and it will be convenient for all parties that I should give up the Secretaryship now, so that I may make over charge of the office to my successor before I leave.

“ I must ask you to convey to the Council and the Society my warm thanks for the confidence they have so long reposed on me, and assure them that, though no longer in office, I shall not cease to take the same hearty interest as heretofore in all that concerns the Society's welfare.

“ Very sincerely yours,

(Signed) “ W. S. ATKINSON.

“ A. GROTE, ESQ., *Vice-President, Asiatic Society.*”

The Chairman then stated that in accordance with the provision of the same Rule, the Council had appointed Mr. H. F. Blanford as Secretary to the Society, which appointment would likewise be submitted to the Society for confirmation at the following meeting. He then proposed and Mr. Grote seconded the following resolutions expressive of the Society's acknowledgment of the eminent services rendered to it by Col. Thuillier and by Mr. Atkinson :—

That the thanks of the Society be given to Col. Thuillier for his conduct of the Society.

This being put to the vote was carried unanimously.

The Chairman proposed that the warm thanks of the Society be given to Mr. Atkinson for his services as Secretary during the long period of more than seven and a half years.

This proposition being put to the vote was carried unanimously.

The chairman further announced that the Council had elected Lieutenant-Colonel J. E. Gastrell and Dr. S. B. Partridge, as members of their body, in the place of Colonel Thuillier and the Hon'ble H. S. Maine, and that Captain W. N. Lees, LL. D., had been appointed a Vice-President of the Society in the place of Mr. E. C. Bayley.

The Council further reported that they had granted to Mr. Blyth a

further leave of nine months on full pay, contingent on the application for pension not being complied with by the Secretary of State for India before the expiration of his present leave.

Communications were received—

1. From the Under-Secretary to the Government of India, Foreign Department; Lieutenant-Colonel Pelly's report of his tour round the northern portion of the Persian Gulf, with journal of the route and a sketch map by Dr. Colvill.

2. From Lieutenant-Colonel J. Abbot; remarks on the site of Aornos.

3. From Lieutenant-Colonel S. R. Tickell; Memo. relative to three Andamanese in the charge of Lieutenant-Colonel S. R. Tickell, when Deputy Commissioner of Amherst, Tenasserim, in 1861.

The Secretary having read this paper, the thanks of the meeting were voted to the author for his interesting remarks.

4. From Baboo Gopinath Sen; Abstracts of the Hourly Meteorological observations taken at the Surveyer General's Office in June last.

5. From Major-General Cunningham; note on a Bactro-Pali inscription from Taxila.

6. From the same; remarks on the date of the Pehewa Inscription of Raja Bhoja.

The Chairman read the papers from General Cunningham.

Babu Rajendralala Mitra, adverting to General Cunningham's comments on his paper on the Bhoja Raja of Dhar and his homonyms, stated that some of the errors dilated upon by the General had been already acknowledged or corrected by him, and that others were due to misapprehensions on the part of that gentleman, which could be easily explained; but they required more time and attention than he could then devote to them, and that, even if he did, he would tire the patience of the meeting by a number of quotations and references which could not be easily followed. There were others, again, he said, which were attributable to differences of opinion, and he did not wonder that they should exist. When it is remembered that scholars differ as to the correct readings of texts published only three or four centuries ago, and that the commentators of Shakespeare had not yet come to a determination as to the original reading of many passages in the writings of that prince of poets, it was but natural that those who had to deal



with smudgy inscriptions recorded on dilapidated stones, battered by the rains of centuries, written in characters now all but unknown, and in languages which had become obsolete, and the decyphering of which had to be effected by a series of guesses, should entertain opinions irreconcilable with each other. These, therefore, he did not wish then to dwell upon. He could not, however, allow that opportunity to pass without adverting to the three instances of "errors of omission" of which he stood charged. They were as injurious to him as they were unfounded, and he wished therefore to give them the earliest possible correction. The first instance, he observed, of which the General complained, was a discovery of his as to the identity of the Bhoja Raja of Gwalior with the great Bhoja of Malwa, noticed in the *Rājataranginī*, which, it was alleged, had been appropriated to himself by the Babu without acknowledgement. The General, in his letter published in the 29th volume of the Journal (p. 395,) says—"Of the Gwalior inscriptions one of the most interesting is a record of Bhoja Deva, dated in 933 Samvat, both in words and figures, A. D. 876. As this date agrees with that assigned to the great Bhoja of Malwa by Kalhan Pundit, viz., A. D. 883-901, there can be little hesitation in attributing this inscription to the *famous* Bhoja." The epithets "great" and "*famous*" used by the General (the latter in Italics,) coupled with the Bhoja of Malwa, leaves no doubt as to his having alluded to the hero of the *Bhoja probandha*, for to no other sovereign of Malwa could those epithets be correctly applied. To him, however, the Babu had made no allusion. In this paper on the Bhojas, he had pointed out the identity of the Bhoja of Gwalior with one of the two Bhojas of Kanouj, of whom General Cunningham had made no mention whatever, and not with the king, of that name, of Malwa, who, he maintained, lived a century after the Prince of Gwalior, and could not, therefore, have been identical. The accusation of misappropriation in connection with the Bhojas was, therefore, entirely unfounded.

With regard to the second instance of error of omission it was remarkable, the Babu noticed, that in the same breath in which the General blamed him for adhering to the old reading of the Rohtas inscription, he accused him of having pirated his new reading. If he did one he could not do the other. The fact, however, was that he had done neither. He had to compare the history of the same line of kings

in two separate inscriptions, the Rohtas and the Narwar, and on finding one of the names to be written *Hungara* in one and *Dungara* in the other, he attributed the difference to an error in the reading of the first named document, as that of the second, he found, had the support of three independent inscriptions from Gwalior. His reading of the documents was perfectly independent of the researches of the General, and his identification the inevitable result of the proofs he had before him, and he could not therefore hold himself in any way indebted for them to his critic, who, to the best of his knowledge, had nowhere given the correct reading *Dungara*. General Cunningham, in his letter on the subject, alluded exclusively to the Rohtas record, and said "the name of the fourth prince has been mis-read, it should be *Dungara* and not *Hungara*." There was nothing to show that when he said this he had read either the Narwar or the Gwalior records, for he made no allusion to them, and his new reading, or more strictly suggestive alteration, was wrong, as he spelt the name with two g's (*Dunggara*) and not with one g (*Dungara*;) he could not therefore fairly claim the credit of a deduction which was founded upon an examination of four, till then, undecyphered documents.

The last instance of alleged error of omission on his part, the Bábu said, referred to the reading of the name of *Huvishka* and his identification with the *Hushka* of the *Rájataranginí* which General Cunningham claimed as his own. The name, however, as read by the General and printed in his letter in the 29th Vol. of the Journal, pages 400 and 401, was *Hovcshka* in the Wardak and *Huveshka* in the Mathurá inscriptions. These readings were got at without decyphering either of those records, and consequently were, to all intents and purposes, quite as much guesses as the General's suggestive reading of *Harishchandra* of the same word, and all three being wrong, had no claim to any consideration.

The Bábu was the first to decypher and translate the Wardak record, and as his reading was different from that of General Cunningham, (*Huvishka* and not *Hoveshka*) he felt bound in justice to himself to deny the claim of the General. The correct reading, *Huvishka*, was first met with in the Mathurá inscription by the Bábu himself, and subsequently in the Wardak record which he read with Mr. Bayley's tentative Nágarí transcript in hand, and he did not feel called upon to concede to the General what was strictly Mr. Bayley's and his

own. Had General Cunningham decyphered or commented upon the Wardak inscription, the Bábu admitted he would have been bound to allude to him had he borrowed from such comment or decypherment, but he repudiated the necessity of quoting incorrect readings of single words given casually in miscellaneous letters, even if he had remembered them, (which in the present instance he did not) and that simply to show that he had come to a different opinion. The identity of *Huvishka* with *Hushka* had been traced by perfectly independent research, and was quite different from that of *Hoveshka* with *Oöerke* and *Hushka*, for it was one thing to say *Huvishka* was the same with *Hushka* and quite another to say *Hoveshka* was the same with *Oöerke*. Where quotation was necessary no quotation was wanting. In the very paragraph in which the identity of *Hushka* and *Huvishka* was mentioned, the Bábu had quoted from the General's paper in the *Numismatic Chronicle* for the date of *Hushka*, and he thought that was all that he was called upon to do. The General in his letter in the 29th Vol. of the Journal, lays great stress on the identity of *Hcveshka* with the *Höerke* or *Oöerke* of the coins, but the Bábu had nowhere named *Oöerke* in his paper on the Wardak record, or attempted to trace his identity. Mr. Bayley, in his published note on that paper, alluded to the "probable" identity of *Huvishka* with *Oöerke* but not of *Hoveshka* with *Oöerke*, and therefore did not name the General. It is possible that the identity supposed by the General might suggest the idea of the identity doubtfully pointed out by Mr. Bayley, but the Bábu hoped that nobody would deny that those who were deeply engaged in the study of Bactrian numismatics, of the history of Kashmir, and of Northwest India generally during the supremacy of the Indo-Scythians, should more readily remember the well-known and well-established identity of *Kanishka* with *Kanerke* and *Hushka* with *Oöerke* and be thereby led to the idea of *Huvishka* being the same with *Hushka*, than remember an isolated passage in a short miscellaneous letter; but even if the reverse of this position be insisted upon, it was not necessary, he contended, to point out the suggestive power of an idea which had been already published and become the property of the public for a long time by quotations of authority and parade of foot-notes. The omission of quotations in such a case, would not in any way amount to neglect of the amenities of literature. The charge, however, was not of benefiting by working out in a different direction the first idea of another, but

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of positive misappropriation of calling the discovery of another as one's own, and as he had shewn that he had nowhere borrowed the General's reading of *Hoveshka*, he held that the charge brought against him was utterly groundless. There was no doubt some similitude between *Huvishka* and *Hoveshka*, and in attempts to read the same document by different individuals such similitude must always occur; but he urged that it would be unjust if he who read the document correctly should be deprived of credit because his predecessors had given an avowedly incorrect but somewhat similar reading of only one of its words. Should the General maintain so wrong a principle and say that the difference between *Hoveshka* and *Huvishka* was immaterial and the credit of reading the word should be his, it should be observed that the syllables which he read *Hovesh* had been before him read to be the same by Mr. Thomas, and the credit of first reading therefore must rest with the latter gentleman and not with him. He regretted much, the Bábu said, that he had to make these remarks, for he entertained the highest respect for the General as a distinguished and most successful antiquarian, who had done much to throw new light on the history of his native land; but he was sorry he could not sit down quietly under the imputation of having misappropriated the discoveries of another.

The President remarked that he was perhaps personally somewhat to blame in the matter, for as Bábu Rajendra Lal had owned to obtaining from himself the reading of *Huvishka* and as the identification of the king of the Wardak Inscription with the *Huvishka* of the Muttra Inscription and the *Hushka* of the Raja Tarangini and the *Oöerke* of the Indo-Scythian coin-series had been already published by Gen. Cunningham, he was bound to say that the source from which he had derived the reading of *Huvishka* was undoubtedly General Cunningham himself. The President's tentative reading and transliteration had been, however, made merely for self-guidance, and the papers were made over without remark to Bábu Rajendra Lal, as the President had no leisure to complete the enquiry.

The Bábu had therefore no notice of the real author of the discovery at the time he wrote his article in question, for which the oversight of the President was chiefly to blame.

But in truth the identification of the *Hushka* of the Raja Tarangini with the *Oöerke* of the coins had been made so long since by General

Cunningham, that the further reading of *Huvishka* and its identification with *Hushka* was a comparatively obvious step, and though the whole merit rests with General Cunningham the earlier discovery is certainly the most important.

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FOR OCTOBER, 1863.

The Monthly General Meeting of the Society was held on the 7th instant.

E. C. Bayley, Esq., President, in the chair.

The proceedings of the last meeting were read and confirmed.

Presentations were received—

1. From the Natural History Society of Dublin, Part 2, of Vol. III. of the Proceedings of the Institution.

2. From Babu Gunesh Chunder Banerjea, a copy of his work entitled *Chitta Santoshini*.

3. From Lieutenant-Colonel E. T. Dalton, three skulls of Moon-dha and Aheer tribes of Chota-Nagpore.

4. From Mr. Grote, on the part of Lieutenant-Colonel R. C. Tytler, an Andamanese Mynah and a Crow.

5. From Mr. Blanford, the skull of a young Polar bear.

6. From the Assistant Secretary to Government of India, Foreign Department, two copies of a series of 17 photographs of tribes inhabiting Cachar and Assam, taken by Dr. Simpson.

7. From the American Philosophical Society, several volumes of the Transactions and Proceedings of the Society.

8. From Mr. H. F. Blanford, the following collection of fossils:—

115 species of German miocene fossils.

104 „ English miscellaneous fossils.

47 „ Swiss cretaceous fossils, (chiefly cephalopoda.)

75 „ German oolitic fossils.

15 „ Indian.

34 „ Miscellaneous.

The following letter, which was read by the President, accompanied the presentation.

“*Asiatic Society's Rooms, 2nd October, 1863.*

“TO THE PRESIDENT OF THE ASIATIC SOCIETY.

“DEAR SIR,—I have the pleasure of offering to the Society the collection of fossils of which the accompanying list is a summary.



Having devoted some months to the determination and arrangement of the Society's fossil collection, I have much satisfaction in being able to add to that collection a series, a considerable number of which being the authentic determinations of two of the first palæontologists of Europe, Dr. Dunker, and M. Pictet, will, I believe, afford useful objects of reference to those who work at palæontology.

"As a valuable and extensive collection of fossils arranged in stratigraphic or geological order has been already formed by Dr. Oldham, I have arranged the fossils of the Society in natural history order, so as to form an integral, as they are an essential, part of a zoological museum. That such a collection is absolutely essential to the working naturalist and palæontologist I can affirm, not only from my own limited experience, but also from that of my late teacher, Edward Forbes, and I believe of palæontologists in general.

"The arrangement is that adopted in the British Museum collection; that of the Geological Museum of Jermyn Street being followed in the Survey Museum of Hasting's Street, in accordance with the requirements of field geologists.

"It is with the view mainly of aiding in the formation of a zoologically arranged series of fossils that I have the pleasure of offering the present collection to the Society; and it is with a view, so far as in me lies, to ensure the perpetuation of such a collection when the Society's museum becomes the property of Government, that I request that, should such a collection not be retained in the new museum, the present collection be then presented to the Presidency College.

"To avoid misapprehension I would say that the retention in the new museum of a zoologically arranged series of fossils, of which the present and all future donations of mine shall form part, is the sole condition I attach to the gift.

"Whether such a collection pass into the geological or zoological section of the new museum, I consider to be matter of secondary importance.

"I trust meanwhile that the Society may receive such additions to its fossil collection from other members of the Society as may render it a worthy representation of fossil zoology.

"I remain, &c., &c.,

(Sd.) "H. F. BLANFORD."

The President then proposed a vote of thanks to the donor, which was unanimously accorded.

9. From Captain Stubbs, Horse Artillery, Meean Meer, a new type of a silver coin of Shere Shah.

The following gentlemen duly proposed at the last meeting, were balloted for and elected ordinary members:—T. Martin, Esq. ; Dr. J. Ewart ; Dr. W. K. Waller ; Major Dickens ; Moulvie Waheedoon Nubee Khan Bahadoor.

The following gentlemen were named for ballot as ordinary members at the next meeting:—

Dr. M'Clelland, proposed by Mr. Grote, and seconded by Mr. Blanford.

Mr. Duff, proposed by Mr. Blanford, and seconded by Dr. Fayrer.

Dr. F. Stoliczka, proposed by Mr. Mallet, and seconded by Mr. Blanford.

R. T. Martin, Esq., barrister-at-law, proposed by Mr. Blanford, and seconded by Mr. Grote.

Major J. G. Gowan, proposed by Mr. Grote, and seconded by Mr. Blanford.

Babu Modhoosoodun Dass of Dacca, proposed by Moulvie Abdool Luteef Khan Bahadoor, and seconded by Moulvie Syud Ahmed Khan Bahadoor.

H. D. Sandeman, Esq., proposed by Mr. Blanford, and seconded by Mr. Bayley.

Letters from Messrs. S. Wauehope, J. Sanders, and from Major Fitzgerald, intimating their desire to withdraw from the Society were recorded.

The appointment of E. C. Bayley, Esq., President, whose election by the council had been announced at the previous meeting of the Society, being put to the vote, the choice of the Council was confirmed without dissent.

The appointment of Mr. Blanford as Secretary was also put to the vote, and confirmed by the meeting.

The election of Lieut.-Col. J. E. Gastrell and Dr. S. B. Partridge as members of the Council in the place of Colonel Thuillier and the Hon'ble H. S. Maine, and that of Captain Lees as a Vice-President of the Society in the place of Mr. E. C. Bayley, were likewise confirmed.

The Council further reported that they had taken into considera-

tion the motion of Captain Lees, and resolved to recommend the dissolution of the Committee of Papers and an alteration in accordance therewith to be made in Rule 77—viz., that in place of the words “sub-committees of finance and papers,” the words “a sub-committee of finance” be substituted.

The proposal being put to the vote by show of hands, it appeared that five votes were in favour of the alteration, and four against it. The President therefore announced that the votes of non-resident members would be taken in accordance with the provisions of Rule 43, and that it would then be finally submitted to the Society at the ensuing annual general meeting.

The Council also submitted the following report of the Philological Committee for the approval of the Society.

*Philological Committee's Report.*

“Dr. Kern, of Benares, has offered to edit the Sanskrit astronomical work, the *Vṛihat Sanhitā* by Varāha Mihira. It will occupy about four fasciculi. The Philological Committee recommend to the Council that it should be accepted, as it will be a valuable continuation of the astronomical works already published in the *Bibliotheca Indica*. They hope that Dr. Kern will add an English translation, which will greatly increase the value of the work.”

The vote of the meeting being taken on the report, the recommendation of the Philological Committee was unanimously adopted.

The President announced that an aerolite which had lately fallen near Dacca had been presented to the Society by the Lieutenant-Governor of Bengal; and he proposed that the thanks of the meeting be voted to his Honor for this valuable donation. The aerolite, he added, was now on its way to the museum.

Communications were received—

1. From J. E. T. Aitchison, Esq., a paper “On the Vegetation of the Jhelum District,” with lithographed maps and plans to illustrate the paper.

2. From the Under-Secretary, Government of India, Public Works Department, copy of a letter from Mr. G. Manners, Officiating Executive Engineer, Barrackpore Division, containing a list of the principal architectural remains near Hooghly.

3. From Babu Gopinath Sen, abstract of the hourly meteorological observations taken at the Surveyor General's office in July last.

4. From Captain H. H. G. Austen, a letter containing an emendation of his article, before submitted, on the system employed in outlining the figures of deities and other religious drawings as practised in Ladakh, Zanskar, &c.

5. From the Under-Secretary, Government of India, Foreign Department, a report by Lieutenant-Colonel Pelly on the tribes, trade, and resources around the shore line of the Persian Gulf.

The Secretary having read extracts from Colonel Pelly's report, the thanks of the meeting were voted to the latter for his interesting remarks.

6. From Captain H. G. Raverty, a paper on the languages of the Siah Posh Kafirs, with a short list of words, to which are added specimens of the Kohistani and other dialects spoken on the northern border of Afghanistan.

7. From T. Oldham, Esq., a note on the fossils in the Society's collection reputed to be from "Spiti."

The Librarian submitted the usual monthly report.

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#### LIBRARY.

The following are the accessions to the Library since the meeting held in July last.

#### *Presented.*

Annals of Indian Administration, Parts 2 and 3 of Vol. VII.—BY THE BENGAL GOVERNMENT.

Annual Report of the Geological Survey of India for 1862-63.—BY THE SUPERINTENDENT, GEOLOGICAL SURVEY.

Annual Report of the Insane Asylums in Bengal for 1862.—BY THE BENGAL GOVERNMENT.

Annual Report with tabular statements on the condition and management of the Jails, N. W. Provinces, for 1862.—BY THE GOVERNMENT N. W. PROVINCES.

The Anthropological Review, No. 1.—BY THE ANTHROPOLOGICAL SOCIETY OF LONDON.

Bijdragen tot de Taal-Land-en Volkenkunde van Nederlandsch Indië, Stuk 5 and 6, Vierde Deel.—BY THE AMSTERDAM ACADEMY.

Calcutta Christian Observer for July, August and September.—BY THE EDITOR.

Chitta Santoshiní.—BY BABU GUNESH CHUNDER BANERJEE.

Biblorum Codex Sinaiticus Petropolitanus. Auspiciis Augustissimis Imperatoris Alexandri II. Vols. 1 to 4.—BY THE IMPERIAL GOVERNMENT OF RUSSIA.

Journal of the Statistical Society of London, Vol. XXVI. Part 2.—BY THE SOCIETY.

Journal of the American Oriental Society, Vol. VII. No. 2.—BY THE SOCIETY.

Journal of the Chemical Society of London, 2nd series, Vol. I. Nos. 4 to 6.—BY THE SOCIETY.

Journal of the Academy of Natural Sciences of Philadelphia, Vol. V. Part 3.—BY THE ACADEMY.

Journal of the Royal Asiatic Society of London, Vol. XX. Part 2.—BY THE SOCIETY.

Jahrbuch der K. K. Geologischen Reichsanstalt, Vol. XII. No. 4, and Vol. XIII. No. 1, and a General Index.—BY THE VIENNA MUSEUM.

Journal of Sacred Literature and Biblical Record, Vol. III. No. 6.—BY THE EDITORS.

Mahábhárata, Bengali Translation, Part 9.—BY BABU KALI PROSONNO SINGH.

The Relations of Landlord and Tenant in India, *Pamphlet*.—BY THE EDITOR OF THE FRIEND OF INDIA.

List of the Fellows of the Zoological Society of London.—BY THE SOCIETY.

Monatsberichte der K. Akademie der Wissenschaften for 1862.—BY THE ACADEMY.

Muir's Sanskrit Texts, Part 4.—BY THE AUTHOR.

Memoirs of the Geological Survey of India, Vol. II. Part 6, 3 copies, and Vol. III. Part 1, one copy.—BY THE GOVERNMENTS OF INDIA AND BENGAL AND BY THE SUPERINTENDENT, GEOLOGICAL SURVEY.

Natuurkundig Tijdschrift voor Nederlandsch Indie, Deel, XXIV.—BY THE BATAVIAN SOCIETY.

The Oriental Baptist for May, June and July.—BY THE EDITOR.

The Oriental Christian Spectator for March.—BY THE EDITOR.

Proceedings of the Royal Geographical Society of London, Vol. VII. Nos. 2 and 3.—BY THE SOCIETY.



Proceedings of the Royal Society of London, Vol. XII. Nos. 55 and 56.—BY THE SOCIETY.

Proceedings of the Academy of Natural Sciences of Philadelphia from January to March, 1863.—BY THE ACADEMY.

Proceedings of the Natural History Society of Dublin, for 1860-62, Vol. III. Part 2.—BY THE SOCIETY.

Proceedings of the Zoological Society of London from June, 1862 to March, 1863.—BY THE SOCIETY.

Proceedings of the American Philosophical Society—Philadelphia, Vol. II. Nos. 23 to 27, Vol. IV. Nos. 28 to 39, Vol. V. Nos. 40 to 50, Vol. VI. Nos. 51 to 60, Vol. VII. Nos. 61 to 63, Vol. VIII. Nos. 67 and 68.—BY THE SOCIETY.

Patra Kaumudí or Book of Letters—By Babu Rajendralal Mitra.—BY THE COMPILER.

Quarterly Journal of the Geological Society of London, Vol. XIX. Nos. 74 and 75.—BY THE SOCIETY.

Report on the operations at the Alguada Reef and Double Island lighthouses for 1862-63.—BY THE GOVERNMENT OF INDIA.

Revue Orientale et Americaine Nos. 43 and 45.—BY THE ETHNOGRAPHICAL SOCIETY OF PARIS.

Report of the British Association for the advancement of Science for 1861.—BY THE BRITISH ASSOCIATION.

Report Statistical and Geographical of the district of Bancoorah — BY THE BENGAL GOVERNMENT.

Rahasya Sandarbha, Vol. I. Nos. 4, 5 and 6.—BY THE CALCUTTA SCHOOL BOOK SOCIETY.

Selections from the Records of the Bombay Government, No. 59 with 7 maps.—BY THE GOVERNMENT OF INDIA.

Chinese and Japanese Repository, Vol. I. No. 1.—By Professor Summers.—BY THE AUTHOR.

Selections from the Records of the Government of India, Foreign Department, No. 39, two copies.—BY THE GOVERNMENT OF INDIA.

Schriften der Koniglichen, Physikalisch-Okonomischen Gesellschaft zu Königsberg, Vol. III. Parts 1 and 2.—BY THE SOCIETY.

Transactions of the Zoological Society of London, Vol. V. Part 2.—BY THE SOCIETY.

Transactions of the American Philosophical Society of Philadelphia,

Vol. VIII. Parts 2 and 3, and Parts 1 to 3 of Vols. IX. X. XI. and XII.—BY THE SOCIETY.

Verhandelingen van het Bataviaasch Gentooschap, Deel XXIX.—BY THE BATAVIAN SOCIETY.

Weber's Indische Studien, Vol. VII. Part 3.—BY THE AUTHOR.

Whitney's Atharva Veda Pratisakhya.—BY THE EDITOR.

Journal Asiatique, Vol. XX. No. 80, and Vol. I. No. 2.—BY THE PARIS ASIATIC SOCIETY.

Zeitschrift der Deutschen Morgenlandischen Gesellschaft, Vol. VII. Parts 1 and 2.—BY THE GERMAN ORIENTAL SOCIETY.

*Exchanged.*

The Athenæum for April, May, June and July, 1863.

The London and Edinburgh Philosophical Magazine, Vol. XXV. Nos. 169, 170 and 171, Vol. XXVI. Nos. 172 and 173.

*Purchased.*

Novorum Actorum Academiæ Caesareæ Leopoldino-Carolinæ Naturæ Curiosorum, Vols. IX. to XXIII., Part 1.

Benfey's Orient und Occident, Vol. II. Part 2.

Sanskrit Worterbuch, Part 4, Bogen 21—30.

Bleeker's Atlas Ichthyologique des Indes Orientales Néerlandaises, Parts 7, 8 and 9.

Catalogue of Fossil Mammalia and Aves in the Museum of the Royal College of Surgeons of England.

Clark's Comparative Grammar.

Grimm's Deutsches Worterbuch, Vol. IV. Part 1.

The Edinburgh Review for July, 1863.

Enault's Histoire de la Littérature des Hindous.

Feriduddin Attar's Mantic Uttair.

Goldstücker's Sanskrit-English Dictionary, Vol. I. Part 5.

Gould's Birds of Asia, Part 15.

Hewitson's Exotic Butterflies, Part 47.

Hagen's Bibliothéque Entomologica, Vols. I. and II.

Kaschmir und das Reich der Siek. Von Carl Freiherrn von Hügel. IV. Band, Zweite Abtheilung.

Jerdon's Birds of India, Vol. II. Part 1.

Lane's Arabic-English Lexicon, Book I. Part 1.

Lewis's Historical Survey of the Astronomy of the Ancients.

Noldeke's *Leben des Mohammad*.

Numismatic Chronicle and Journal of the Numismatic Society of London, New Series, No. 10.

Námi's Poems, (*Wámik Azrá, Khusrau Shírín, and Lailí Majnún*.) Persian MS.

The Parthenon, Vol. II. Nos. 51 to 55.

Palæontographical Society's Publications, 7 Vols.

The Quarterly Review for April and July, 1863.

The American Journal of Sciences and Arts for March, May and July, 1863.

Reeve's *Conchologia Iconica*, Parts 226 to 229.

Rosenzweig's *Auswahl aus den Diwanen*.

Sir G. C. Lewis on the decipherment and interpretation of Dead Languages. By P. Le Page Renouf.

Stelling's *Bau und die Verrichlungen des Gehans*.

Tornberg's *Ibn-Athiri*, Vol. IX.

*Tabakát-i-Akbar Shahi*, Persian MS.

Tugault's *Elements de la Langue Malaise ou Malaye*.

*Revue et Magasin de Zoologie*, Nos. 3, 4, 5 and 6 for 1863.

*Revue des Deux Mondes* for April, May, June, July and 1st August, 1863.

The Annals and Magazine of Natural History, Vol. X. Nos. 65 to 68.

Monier Williams on Indian Epic poetry.

Weber's *Indische Studien*, Vol. VII. Parts 1 and 2.

*Comptes Rendus*, Vol. LVI. Nos. 12 to 26, and Vol. LVII. Nos. 1 to 3, with an Index to Vol. LV.

*Journal des Savants* for April, May, June and July, 1863.

The Natural History Review for July, 1863.

Zenker's *Dictionnaire Turc-Arabe-Persan*, Part 4.

LALGOPAL DUTT.

7th October, 1863.

*Report of the Curator, Zoological Department.*

(Continued from page 90.)

VII. From the Melbourne Institution. A collection of Mammals and birds, the skin of one reptile and that of a fish.\*

The Mammals are—

Of PLACENTALIA Fam. MURIDÆ,—

\*HAPALOTIS APICALIS, Gray, *P. Z. S.* 1851, p. 126. (2 specimens).

\*H. MITCHELLII; *Dipus Mitchellii* Ogilby, *Tr. L. Soc.* XVIII., 129. (2).

\*MUS—? Length 4 in., with tail about 3 in.; hind foot  $\frac{1}{4}\frac{5}{8}$  in.: ear-conch small, posteriorly  $\frac{3}{8}$  in. Fur straight, rather long, of the ordinary rat-brown above, ashy beneath, and the feet somewhat albescent; tail clad with short hairs, blackish above, albescent below. (2).

\*MUS—? Like a diminutive HAPALOTIS, with the exception of the tail. Length  $3\frac{1}{4}$  or  $3\frac{1}{2}$  in., with tail  $2\frac{1}{2}$  in.; hind foot  $\frac{3}{4}$  in.; ear-conch ample,  $\frac{1}{2}$  in. long posteriorly. Colour light brown above, the tips of the hairs black upon the back; below pure white, abruptly separated from the hue of the upper parts; tail dark above, whitish below and tolerably well clad; feet white. (2).

Of MARSUPIALIA,—

\*PHASCOGALE CRASSICAUDATA; *Podabrus crassicaudatus*, Gould, *P. Z. S.* 1844, p. 105; Mammals of Australia, pt. I. pl. 5; Waterhouse, *Mamm.* I., 428. (2).

\*PERAMELES OBESULA; *Didelphys obesula*, Shaw; Waterhouse, *Mamm.* I., 368. (2).

\*P. GUNNII, Gray; Waterhouse, *Mamm.* I., 376.

\*BETTONGIA GRAII; *Hypsiprymnus Graii*, Gould, *P. Z. S.* 1840, p. 178; Waterhouse, *Mamm.* I., 203. (2).

\*HYPSPRYMNUS RUFESCENS; *Bettongia rufescens*, Gray, *M. N. H. n. s.*, I. (1837), 584: *Hypsiprymnus melanotis*, Gould, *Monogr.* pt. 2; Waterhouse, *Mamm.* I., 196.

\*MACROPUS FRÆNATUS, Gould, *P. Z. S.* 1840, p. 92; Gould, *Monogr.* pt. I. pl. 13. (2). Also skull.

\* Species new to the Society's museum are distinguished by having an asterisk prefixed.

M. GIGANTEUS; *Didelphys gigantea*, Schreber; Waterhouse, *Mamm.* I. 62. Adult male; and female sent as *M. ocydromus*, Gould, *Ann. Mag. N. H.*, X. (1842), p. 1,—considered by Mr. Waterhouse to be a variety of the former. We had previously but a small example of this species, with its skeleton.

The Birds are—

LICMETIS NASICUS; *Cacatua nasica*, Temminck: Gould's *B. Austr.* V. 5.

\*CACATUA LEADBEATERI, Vigors: Gould's *B. Austr.* V. 2.

\*POLYTELIS MELANURA; *Palæornis melanura*, Vigors: Gould's *B. Austr.* V. 16. (2).

PLATYCERCUS FLAVEOLUS, Gould's *B. Austr.* V. 25. (2).

PL. BARNARDII, Vigors and Horsfield: Gould's *B. Austr.* V. 21. (2).

\*PSEPHOTUS HEMATOGASTER, Gould's *B. Austr.* V. 33. (2).

\*PS. MULTICOLOR; *Psittacus multicolor*, Temminck; Gould's *B. Austr.* V. 35. (2).

PS. HEMATONOTUS, Gould's *B. Austr.* V. 36.

EUPHEMA CHRYSOSTOMA; *Psittacus chrysostomus*, Kuhl.: Gould's *B. Austr.* V. 37. (2).

MEROPS ORNATUS, Latham; Gould's *B. Austr.* II. 16. (2).

This would appear to be the only Australian Bee-eater. It is not, however, peculiar to Australia; for Mr. Wallace lately obtained it in Ternate (*P. Z. S.* 1860, p. 348). It is not generally known among ornithologists; that the SCYTHROPS NOVE HOLLANDIÆ has been procured in Celebes and Batehian—apparently the limit of its equatorial migration.

CUCULUS INORNATUS, Vigors and Horsfield: Gould's *B. Austr.* IV. 85. (2).

C. CINERACEUS, Vigors and Horsfield: Gould's *B. Austr.* IV. 86.

CHRYSOCOCCYX LUCIDUS; *Cuculus lucidus*, Gmelin; Gould's *B. Austr.* IV. 89.

GRALLINA PICATA; *Gracula picata*, Latham: Gould's *B. Austr.* II. 54. (2).

\*CHLAMYDERA MACULATA, Gould's *B. Austr.* IV. 8. (2).

\*CINCLOSOMA CASTANOTUS, Gould's *B. Austr.* IV. 5. (2).

FALCUNCULUS GOULDII, Cabanis; *F. frontatus*, (Latham), *apud* Gould's *B. Austr.* II. 79. (2).



. OREOICA CRISTATA ; *Turdus cristatus*, Lewin : Gould's *B. Austr.* II. 81. (2).

\*SPHENOSTOMA CRISTATUM, Gould's *B. Austr.* III. 17.

\*POMATORHINUS SUPERCILIOSUS, Vigors and Horsfield ; Gould's *B. Austr.* IV. 22.

\*P. PILEATUS, nobis, *n. s.* Distinguished from the last by having a bright ferruginous-brown cap, bordered by the white *supercilia*, and conspicuous white tips to the wing-coverts and tertiaries : the feet also are more robust. Sent as male of the preceding race ; the sexes of which (according to Mr. Gould) are quite similar in plumage.

\*CLIMACTERIS ERYTHROPS, Gould, *var. ?* (CL. AFFINIS, nobis, *n. s. ?*). Like CL. ERYTHROPS, but with slight pale non-rufous *supercilia*, which are not conspicuously noticeable : throat dull whitish, passing to greyish on breast, and a small central ferruginous spot at base of throat : ear-coverts pale, streaked. Specimen doubtless of the female sex.

\*SITTELLA PILEATA, Gould's *B. Austr.* IV. 104.

. COLLURICINCLA HARMONICA ; *Turdus harmonicus*, Latham : Gould's *B. Austr.* II. 74. (3).\*

\*PACHYCEPHALA GILBERTII, Gould's *B. Austr.* II. 71.

. P. RUFIVENTRIS ; *Sylvia rufiventris*, Latham : *P. pectoralis* apud Gould's *B. Austr.* II. 67. (2).

PETROICA BICOLOR, Swainson : Gould's *B. Austr.* III. 7. (2).

\*P. GOODENOVII *Muscicapa Goodenovii*, Vigors and Horsfield : Gould's *B. Austr.* III. 5.

\*MALURUS MELANOTUS, Gould's *B. Austr.* III. 21. (2).

SEISURA INQUIETA ; *Turdus inquietus*, Latham : Gould's *B. Austr.* II. 87.

\*RHIPIDURA (?) MOTACILLOIDES, Vigors and Horsfield : Gould's *B. Austr.* II. 85.

\* Gould, in his 'Birds of Australia,' restricts the range of C. HARMONICA to E. and S. Australia, and of C. SELBII to Tasmania. We have, however, both types alike from Port Philip or Victoria land and Van Dieman's land : but, in each case, offering a certain amount of difference. C. SELBII, from Port Philip, has rather a small bill, the throat is but slightly albescent, and the breast not at all so, but uniform brownish-ashy, passing to sullied white on the belly and lower tail coverts. Length of bill to gape  $1\frac{1}{4}$  in., in the Tasmanian bird  $1\frac{1}{2}$  in. ; of closed wing respectively  $5\frac{1}{4}$  in., and 5 in. ; and tail  $4\frac{1}{4}$  and 4 in. : the Port Philip bird being thus the larger of the two, but having a conspicuously smaller bill. The Tasmanian C. HARMONICA accords in dimensions with the continental race ; but its plumage is altogether browner, having the ashy tinge much weaker.

GRAUCALUS MENTALIS, Vigors and Horsfield : Gould's *B. Austr.* II. 56. (4).

ARTAMUS SORDIDUS ; *Turdus sordidus*, Latham : Gould's *B. Austr.* II. 27. (2).

\*A. LEUCOPYGIALIS, Gould's *B. Austr.* II. 33. Of two specimens sent, one is wholly undistinguishable from A. LEUCORHYNCHUS, (L), from the Andaman islands (!) ; while the other has rather more of white upon the rump.

MANORHINA GARRULA ; *Merops garrulus*, Latham : Gould's *B. Austr.* IV. 76.

\*PLECTORHYNCHA LANCEOLATA, Gould's *B. Austr.* IV. 47.

\*MELITHREPTUS GULARIS, Gould's *B. Austr.* IV. 71.

ENTOMYZA CYANOTIS ; *Gracula cyanotis*, Latham : Gould's *B. Austr.* IV. 68.

\*TROPIDORHYNCHUS CITREOGULARIS, Gould's *B. Austr.* IV. 60. (2).

ACANTHOGENYS RUFOGULARIS, Gould's *B. Austr.* IV. 53. (2).

\*PTILOTTIS SONORUS, Gould's *B. Austr.* IV. 33.

\*OCYPHAPS LOPHOTES ; *Columba lophotes* Temminck, Gould's *B. Austr.* V. 70. (2).

GEOPELIA TRANQUILLA, Gould's *B. Austr.* V. 73. (L).

DROMAIUS NOVÆ-HOLLANDIÆ ; *Casuarius novæ-hollandiæ*, Latham : Gould's *B. Austr.* VI. 1. Young.

ERYTHROGONYS CINCTUS, Gould's *B. Austr.* VI. 21.

\*ARDEA PACIFICA, Latham : Gould's *B. Austr.* VI. 52. (2).

BOTAURUS MELANOTUS, G. R. Gray : Gould's *B. Austr.* VI. 64. (2).

LARUS (GABIANUS) PACIFICUS, Latham, *apud* Bonap., *nec apud* Gould ; young. We have another Australian example in similar plumage ; and a third, from the Cape of Good Hope, in adult plumage (*J. A. S.* XXIX. 101.). A much larger bird, otherwise similar, but of which the black of the mantle of the adult is less intense, we also possess, from Australia : and this I take to be L. (GABIANUS) GEORGI, King, *apud* Bonap. (*pacificus* *apud* Gould's *B. Austr.* VII. pl. 19) : but Mr. Gould combines, in his figure of the adult, the greater size of the latter race, with the deeper-black mantle of the former ; stating, that his figures are about two-thirds of the natural dimensions. Length of closed wing, of the larger race,  $18\frac{1}{2}$  in. ; of the smaller, 15 in.

XEMA NOVÆ-HOLLANDIÆ ; *Larus novæ-hollandiæ*, Stephens : Gould's *B. Austr.* VII. 20.

\**THALASSEUS POLIOCERCUS*, Gould's *B. Austr.* VII. 24.

\**PHALACROCORAX CARBOIDES*, Gould's *B. Austr.* VII. 66.

Undistinguishable, so far as I could perceive, from *PH. CARBO* of the northern hemisphere.

The Reptile is—

*HYDROSAURUS VARIUS*; *Lacerta varia*, Shaw. Specimen exceeding 55 in. in length; and distinct from another Australian *HYDROSAURUS* in the Society's Museum, which I have hitherto supposed to be the *H. VARIUS*. The latter may be described as

*H. OCELLARIUS*, nobis, *n. s.* Scales on the head and face very much smaller than in *H. VARIUS* and *H. SALVATOR*; those on the neck also smaller; and the transverse rows of scales upon the tail are uniform in size throughout, and on its lower surface are much smaller than in the others: the claws also are weaker and less hooked. Colour blackish; a yellow stripe from the eye, and another from the gape continued along the sides of the neck: sides of the body with numerous transverse rows of yellow rings, which are continued across the back more distinctly posteriorly: a series of well-defined narrow yellow stripes crossing the tail, the tip and under surface of which are spotless yellowish; rest of the under-parts freckled with black scales: limbs spotted and barred with yellow, including the upper surface of the toes. Length of specimen about 32 in.\*

The Fish is—

*HETERODONTUS PHILIPPI*; *Squalus Philippi*, Bloch Schneider; *Cestracion Philippi*, Agassiz; *C. Quoyi*, de Framenville. 'Port Jackson Shark.'

VIII. Bábu Rajendra Mallika. Several dead animals: among them a buli Gayál (*BOS FRONTALIS*); a doe fallow deer; a large male pig-tailed monkey (*INUUS NEMESTRINUS*); and a hybrid monkey, a cross between the preceding individual and a female of the Cape

\* Specimens of a *HYDROSAURUS* from the Andaman and Nicobar islands appear to differ only in colouring from *H. SALVATOR*; the transverse rows of *ocelli* upon the body being rarely traceable, however, faintly, while the entire upper surface is besprinkled with dull yellow scales. The *H. SALVATOR* I obtained at Mergui; and *MONITOR DRACONA* at Patpoung, upper Martabau. The length which Dr. Gray assigns to his Australian *H. GIGANTEUS*, viz. 78 in., is commonly attained by *H. SALVATOR*. We have one of that length from Ceylon, and have seen several from Lower Beugal. It appears to be the ordinary length of the full grown animal.

Baboon (*CYNOCEPHALUS PORCARIUS*). The last is, I believe, the first instance of a *hybrid monkey* on record. The infantile specimen resembles much the young of the *NEMESTRINUS*, but has the considerably more developed tail of the *PORCARIUS*. The two parents had been long kept together.

IX. Lt. Beavan, now with the Darjiling sappers. Skull of an Otter (*AONYX*), killed near the road from Calcutta to Barrackpore. Also sundry birdskins.

X. Lt. Forbes, late 2nd B. N. I. A pair of *TETRAOGALLUS TIBETANUS*, Gould.

XI. Lt. Campbell, H. M. 90th Regt. A skin of *DIOMEDEA EXULANS*, L.

XII. His Excellency Earl Canning, Viceroy and Governor-General of India. The carcass of an adult male Giraffe. I much wished to have had this prepared as a stuffed specimen; but owing to the protracted absence from duty of our head taxidermist, the skin could not be properly set up. The skeleton, however, has been preserved; and is that of a considerably larger animal than was the female already mounted as a skeleton, the carcass of which was presented to the Society by Viscount Hardinge.

XIII. Lt.-Col. Nuttall, late in command of the Arakan battalion. A few bottles of snakes, of well known species; and one containing numerous specimens of *TEREDO NAVALIS* extracted from their perforations. A water snake in this collection, new to the Society's museum, is the *ATURIA CAPENOIDES* of Gray's Catalogue of the snakes in the British Museum.

XIV. J. F. Galiffe, Esq. Several living examples of *GECKO VERUS*, from the vicinity of Calcutta.

XV. J. H. Gurney, Esq., M. P., of Catton Hall, near Norwich. Skin of *FALCO PEREGRINUS*, L., from Inverness; *MILVUS ATER*, (Gmelin), ♀ from Tangier, and specimen in immature plumage; *M. AFFINIS*, Gould, from Australia; *GYPs vulgaris*, Savigny, (*G. Ruppellii*, Pr. Bonap), young, from Natal, *SERINUS MERIDIONALIS*, Pr. Bonap, 2♂ 1♀, from Algeria and *ARDEOLA COMATA*, (Pen.) in winter dress, from Natal.

Mr. Gurney writes—"I have a good series of kites from China and one specimen from Japan; but my series of Indian kites is not so good as it ought to be, and I have none from Ceylon. I have not a

sufficient series of Indian kites to make a satisfactory comparison between them and the Chinese.

"I have one or two small Indian kites which appear to me to be identical with the *MILVUS AFFINIS* of Australia: *M. AFFINIS* I have also received from Macassar; and I have some Chinese kites which appear quite adult and in which the pale streaks have entirely disappeared, as in adult specimens from India.

"I have never yet been able to discover any difference in the plumage of old and young specimens of *M. AFFINIS*—which is remarkable, as there is so great a difference in the case of *M. GOVINDA* and *M. ATER*, and also a difference (though much less) in the case of *M. PARASITICUS*.

"The British Museum contains adult specimens of the Falcon which I presume you identify with *F. CALIDUS* of Latham; but I have a suspicion that the true *F. PEREGRINUS* is sometimes found in India, as well as *F. CALIDUS*.

"Capt. Irby has brought a Falcon from Oudh which appears to Mr. Selater and myself to belong to an undescribed species intermediate to *F. CALIDUS* and *F. LANARIUS* of Schlegel (*Feldeggi*, auctorum). Besides Capt. Irby's specimen, which he has kindly presented to the Norwich museum, we have two other examples of this Falcon there—one said to be from Abyssinia, the locality of the other unknown. The late E. I. Company's Museum contains a fourth specimen brought from Babylon by the 'Euphrates' exploring expedition. (Since published as *F. BABYLONICUS*, Gurney, in *the Ibis*, Vol. III. p. 218).

"*F. PEREGRINATOR* (as you justly say) is a well marked species, and very distinct from all the above. It is singular that it has never yet (so far as I know) been figured in *fully* adult plumage.

"*F. JUGGUR* belongs to a distinct group, in which are two other species, *viz.* *F. SACER*, Schlegel,=*F. LANARIUS*, auctorum,—and *F. POLYAGRUS* of N. America."\*

\* The more typical Falcons appear to me to resolve into—

1. *Arctic or Jer. Falcons* (excluding certain species from Australia and N. Zealand).

2. *Desert Falcons*. The Lanner group, to which *F. SACER*, *F. JUGGUR*, *F. BABYLONICUS*, and *F. PEREGRINOIDES* appertain; and to which the *LERACIDEA* of Mr. Gould approximates, his supposed two species, being (in Dr. Jerdon's, and my own opinion) in all probability but young and old of the same; as also the alleged 'Jer. Falcons' of the Southern Hemisphere.

3. *Cliff Falcons*: consisting of the Peregrine group.



XVI. H. H. The Maharájá of Burdwán. The stuffed skin of a two headed calf.

XVII. Mr. C. K. Hamilton, Calcutta. A canine tooth of the great 'Elephant-seal,' or 'Sea-elephant' MORUNGA PROBOSCIDEA, (Desmarest).

XVIII. Mr. Morgan. A small common Rat (*MUS DECUMANUS*), with abnormally developed rodent-tusks.

XIX. Major W. A. Anstruther Thomson, Commander of the Viceroy's Body-guard. A Cuttle-fish common in the Bay of Bengal.

XX. Lt. W. G. Murray, Topographical Assistant G. T. Survey. A box of bird skins from the Dholpur and Gwalior territories. The only noteworthy specimen is that of a female *PROPASSER* of Hodgson, which cannot be referred to any of the species hitherto recognised:—

*PR. MURRAYI*, nobis, *n. s.* Most nearly affined perhaps, to *PR. RODOPEPLA* (Vigors); but the bill much smaller, shaped more as in *PR. RODOCHROUS*, (Vigors), though more elongated and distinctly approximating in form to that of *PROCARDUELIS*, Hodgson. Colour brown above, paler below, a little rufescent on the rump, belly, and upper and lower tail-feathers; very indistinctly striated, except on the crown where the feathers have contrasting pale lateral edges: a tolerably distinct rufescent whitish supercilium; and the throat also rufescent whitish, with dusky spots towards and upon the chin: greater and less wing-coverts pale-tipped, and tertiaries pale-margined, the secondaries much more narrowly pale-margined. Bill and feet corneous. Length about  $6\frac{1}{2}$  in.; of closed wing 3 in.; and tail  $2\frac{1}{2}$  in., bill to frontal point  $\frac{9}{16}$  in. The male will, of course prove to be more or less crimson like that of its congeners.

A very fine new species of this Genus has lately been obtained by Lieut. Beavan of the late 62nd B. N. I., on Tonglu mountain (10,000 ft.), on the Sikhim frontier bordering on Nipál; together with other novelties in the bird class, and several known species that are rare in collections. I avail myself of this opportunity to introduce the former.

*PR. FRONTALIS*, nobis, *n. s.* Most resembling *PR. RODOPEPLA*, (Vigors), but the bill smaller, and the tail longer. Broad frontal band, supercilia, and feathers of cheeks and throat, consisting of elongated plumes, vinaceous with glistening whitish medial line more or less developed, the entire feathers composing the frontal band being thus whitish; rest nearly as in *PR. RODOPEPLA*, but without the ruddy

tinge above, or the pale spots on centre of back, and the upper tail-coverts (as well as the feathers of the rump) are broadly tipped with rosyvinaceous; crown, nape, and back, deep brown with a blackish central streak to each feather; tertiaries margined with whitish, greater wing-coverts the same towards their tips, and the next range of wing-coverts having each an oval terminal spot; axillaries and under-coverts of the wing white; primaries and tail dusky; bill and feet brown. The female is similar to the male above, but has no frontal band, the supercilia are whitish, and the rump feathers are margined with golden fulvous; throat and breast rufous, the cheeks and sides of the throat and the abdominal region, whitish, with a strongly marked black median line to each feather. Length of wing  $2\frac{1}{4}$  in., of tail 3 in.; tarse  $\frac{7}{8}$  in. Female rather smaller. From Tonglu mountain.

Also a very fine new species of true Bullfinch, being the fourth now known to inhabit the Himalaya.

*PYRRHULA ERYTHACA*, nobis, *n. s.* Upper parts pure ashy, like the back of *P. VULGARIS*, Ray, also the front of the neck becoming whitish on the throat; pectoral region fine red; the abdominal pale ashy, and the lower tail-coverts white; a broad white band on the rump, as in *P. VULGARIS*, above which is a slight black band, and the upper tail-coverts and tail are rich purple-black, the middle tail feathers being  $\frac{3}{4}$  in. shorter than the outermost; a black ring encircles the bill, and spreads over the loreal region, this ring being bordered and set off with white; wings black, except the smallest coverts which are grey, and a brownish-grey band ( $\frac{1}{2}$  in. broad) tipping the greater coverts; no red mark upon the tertiaries. Bill black and feet pale. Length of wing  $3\frac{3}{8}$  in., and of tail 3 in. This fine species is as large as *P. NIPALENSIS*, Hodgson, and serves to link that somewhat peculiarly coloured species with its congeners. The female is unknown. From Tonglu mountain.

*PARUS BEAVANI*, nobis, *n. s.* Like *P. RUFONUCHALIS*, nobis, of the N. W. Himálaya, but the black much less extended upon the breast as in *P. MELANOLOPHUS*, Vigors; no trace of rufous, on the white nuchal spot, but the axillaries and lower tail-coverts are of this hue. From Tonglu mountain.

*ANTHUS ROSACEUS*, Hodgson. This is not the *A. CERVINUS*, Pallas, of China, Upper Pegu, and also the Andaman islands. The upper parts are much darker, the ear-coverts are duskyish whereas in the other

they are light rufous like the supercilia, which latter are also whitish in the bird from Tonglu, contrasting strongly with the dark crown and ear-coverts. In the other race the supercilia are of the same hue with the lores and cheeks (*A. rufosuperciliaris*, nobis, *passim*). The throat, also, in the Tonglu specimen is much paler than in the other.

A specimen of a *CORYPHEDEA* in Lt. Beavan's collection is of an extraordinary pale grey colour, nearly as in *ALAUDA RAYTAL*, (B. Ham.); but I cannot venture to describe it as a distinct race.

*P. S.* The following letter on the *Cetacea* of the Chinese Seas, from R. Swinhoe, Esq., British Consul at Formosa, will be read with interest.

"Some time ago you asked me for information about Whales, in these Seas. I have kept your request in mind, though I have not till now succeeded in meeting with any one who could give me information on the subject. My informant was many years at Swatow, off which port more Whales have been seen than elsewhere on this coast, and I will now narrate what I have been able to gather from him. Whales visit the Straits of Namoa regularly every May. They are mostly *cows*, and are usually accompanied with their calves some 20 or 30 ft. long. Some of the adults attain the length of 70 feet. When the opium ships were anchored off Namoa island, these cetals used to gambol round them in the night-time, making their proximity known by the loud puffing noise they made, which resembled the sound produced by the piston of a steam-engine. In the day-time they were to be seen putting their long heads out of the water and opening their immense jaws. The Captain of a vessel broke the back of one of them with a cannon-shot, and the animal lashed about the water some hours before he died. He drifted on shore eventually on Namoa island, and was cut up by the native Chinese. Some enterprising Americans at Hong-Kong, on hearing of the occurrence of Whales in this Strait, fitted out a *lorcha* for their capture. The whalers landed at Swatow, built huts and erected boiling-vats, and then started to the pursuit. They soon, however, returned from the expedition, saying that the Whales were only *Razor-backs*, the same with those found off San Francisco, which are dangerous creatures to meddle with, and yield too little oil to compensate for the trouble and risk incurred in their capture. The whalers took down their gear and returned to Hong-Kong. These Whales have very large flat heads, and *smooth* backs. Some

ten or eleven years ago American whalers used to rendezvous at Hong-Kong, and thence send their oil to the States ; but the *citizens* that had settled in the colony treated them so badly and cheated them so much, that they now seldom come there, preferring to make their head-quarters at the Sandwich islands.

“ Some time in spring last year a large Whale was stranded on the sand-spit at Takow (Formosa) ; and I hear that scarcely a year passes but one is stranded somewhere in the vicinage of Swatow.

“ In May 1860, I saw a huge beast of the Whale kind thrust himself half out of the water, when I was on my way from Hong-Kong to Amoy in the Mail-Steamer.

“ Of other cetals, I know only of the large *White Porpoise* that visits Amoy and other southerly harbours from the Sea. I have striven in vain to procure specimens, but may yet succeed.”

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*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11.

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | o                             | o                                             | o    | o     |
| 1     | 29.506                                          | 29.561                                    | 29.446  | 0.115   | 89.8                          | 97.4                                          | 82.8 | 14.6  |
| 2     | .511                                            | .601                                      | .459    | .142    | 89.8                          | 98.6                                          | 80.8 | 17.8  |
| 3     | .504                                            | .561                                      | .428    | .133    | 88.1                          | 96.9                                          | 78.8 | 18.1  |
| 4     | .470                                            | .523                                      | .398    | .125    | 89.5                          | 96.7                                          | 84.4 | 12.3  |
| 5     | .501                                            | .537                                      | .451    | .086    | 90.2                          | 97.2                                          | 85.6 | 11.6  |
| 6     | .590                                            | .688                                      | .518    | .170    | 90.3                          | 97.8                                          | 77.0 | 20.8  |
| 7     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 8     | .649                                            | .695                                      | .583    | .112    | 84.6                          | 89.6                                          | 79.6 | 10.0  |
| 9     | .659                                            | .738                                      | .602    | .136    | 83.0                          | 86.8                                          | 78.0 | 8.8   |
| 10    | .629                                            | .705                                      | .559    | .146    | 85.5                          | 90.9                                          | 81.4 | 9.5   |
| 11    | .565                                            | .606                                      | .499    | .107    | 82.2                          | 91.4                                          | 77.8 | 13.6  |
| 12    | .538                                            | .594                                      | .474    | .120    | 80.9                          | 84.9                                          | 77.8 | 7.1   |
| 13    | .549                                            | .596                                      | .504    | .092    | 81.8                          | 86.4                                          | 79.8 | 6.6   |
| 14    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 15    | .567                                            | .627                                      | .525    | .102    | 82.6                          | 87.2                                          | 79.8 | 7.4   |
| 16    | .619                                            | .665                                      | .550    | .115    | 82.5                          | 86.2                                          | 80.4 | 5.8   |
| 17    | .597                                            | .656                                      | .527    | .129    | 84.2                          | 90.4                                          | 80.0 | 10.4  |
| 18    | .508                                            | .553                                      | .435    | .118    | 83.3                          | 88.6                                          | 80.2 | 8.4   |
| 19    | .420                                            | .487                                      | .347    | .140    | 83.5                          | 89.4                                          | 80.5 | 8.9   |
| 20    | .326                                            | .406                                      | .268    | .138    | 82.4                          | 85.8                                          | 80.2 | 5.6   |
| 21    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 22    | .482                                            | .558                                      | .446    | .112    | 81.7                          | 85.4                                          | 78.8 | 6.6   |
| 23    | .536                                            | .579                                      | .482    | .097    | 82.0                          | 85.0                                          | 79.4 | 5.6   |
| 24    | .491                                            | .552                                      | .417    | .135    | 80.1                          | 83.2                                          | 78.0 | 5.2   |
| 25    | .356                                            | .450                                      | .268    | .182    | 83.4                          | 88.8                                          | 79.4 | 9.4   |
| 26    | .264                                            | .315                                      | .199    | .116    | 82.4                          | 86.7                                          | 79.0 | 7.7   |
| 27    | .289                                            | .410                                      | .189    | .221    | 81.6                          | 86.0                                          | 78.4 | 7.6   |
| 28    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 29    | .526                                            | .578                                      | .482    | .096    | 84.7                          | 88.8                                          | 80.6 | 8.2   |
| 30    | .512                                            | .559                                      | .440    | .119    | 85.1                          | 93.0                                          | 78.6 | 14.4  |

The Mean height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Thermo-<br>meter. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Vapour<br>in a Cubic foot of air. | Additional Weight of Va-<br>pour required for com-<br>plete saturation. | Mean degree of Humidity,<br>complete saturation be-<br>ing unity. |
|-------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|       | °                               | °                   | °                   | °                            | Inches.                          | T. gr.                                           | T. gr.                                                                  |                                                                   |
| 1     | 82.2                            | 7.6                 | 77.6                | 12.2                         | .0928                            | 9.83                                             | 4.59                                                                    | 0.68                                                              |
| 2     | 82.1                            | 7.7                 | 77.5                | 12.3                         | .925                             | .80                                              | .62                                                                     | .68                                                               |
| 3     | 81.3                            | 6.8                 | 77.2                | 10.9                         | .916                             | .73                                              | 3.99                                                                    | .71                                                               |
| 4     | 83.3                            | 6.2                 | 79.6                | 9.9                          | .989                             | 10.48                                            | .81                                                                     | .73                                                               |
| 5     | 83.4                            | 6.8                 | 79.3                | 10.9                         | .979                             | .36                                              | 4.23                                                                    | .71                                                               |
| 6     | 82.5                            | 7.8                 | 77.8                | 12.5                         | .934                             | 9.87                                             | .76                                                                     | .68                                                               |
| 7     | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 8     | 80.1                            | 4.5                 | 76.9                | 7.7                          | .908                             | .70                                              | 2.69                                                                    | .78                                                               |
| 9     | 78.8                            | 4.2                 | 75.9                | 7.1                          | .879                             | .44                                              | .38                                                                     | .80                                                               |
| 10    | 81.2                            | 4.3                 | 78.2                | 7.3                          | .916                             | 10.11                                            | .61                                                                     | .80                                                               |
| 11    | 78.6                            | 3.6                 | 76.1                | 6.1                          | .885                             | 9.51                                             | .03                                                                     | .82                                                               |
| 12    | 78.0                            | 2.9                 | 76.0                | 4.9                          | .882                             | .50                                              | 1.60                                                                    | .86                                                               |
| 13    | 79.1                            | 2.7                 | 77.2                | 4.6                          | .916                             | .85                                              | .55                                                                     | .86                                                               |
| 14    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 15    | 79.2                            | 3.4                 | 76.8                | 5.8                          | .905                             | .71                                              | .97                                                                     | .83                                                               |
| 16    | 79.0                            | 3.5                 | 76.5                | 6.0                          | .896                             | .63                                              | 2.01                                                                    | .83                                                               |
| 17    | 79.6                            | 4.6                 | 76.4                | 7.8                          | .893                             | .56                                              | .68                                                                     | .78                                                               |
| 18    | 79.9                            | 3.4                 | 77.5                | 5.8                          | .925                             | .92                                              | .01                                                                     | .83                                                               |
| 19    | 79.9                            | 3.6                 | 77.4                | 6.1                          | .922                             | .89                                              | .11                                                                     | .82                                                               |
| 20    | 79.1                            | 3.3                 | 76.8                | 5.6                          | .905                             | .71                                              | 1.90                                                                    | .84                                                               |
| 21    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 22    | 78.7                            | 3.0                 | 76.6                | 5.1                          | .899                             | .67                                              | .70                                                                     | .85                                                               |
| 23    | 79.4                            | 2.6                 | 77.6                | 4.4                          | .928                             | .99                                              | .48                                                                     | .87                                                               |
| 24    | 77.6                            | 2.5                 | 75.8                | 4.3                          | .876                             | .46                                              | .38                                                                     | .87                                                               |
| 25    | 79.6                            | 3.8                 | 76.9                | 6.5                          | .908                             | .72                                              | 2.24                                                                    | .81                                                               |
| 26    | 79.6                            | 2.8                 | 77.6                | 4.8                          | .928                             | .97                                              | 1.64                                                                    | .86                                                               |
| 27    | 78.3                            | 3.3                 | 76.0                | 5.6                          | .882                             | .48                                              | .86                                                                     | .84                                                               |
| 28    | <i>Sunday.</i>                  |                     |                     |                              |                                  |                                                  |                                                                         |                                                                   |
| 29    | 80.2                            | 4.5                 | 77.0                | 7.7                          | .910                             | .73                                              | 2.69                                                                    | .78                                                               |
| 30    | 80.7                            | 4.4                 | 77.6                | 7.5                          | .928                             | .91                                              | .66                                                                     | .79                                                               |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January, 1863, the Greenwich New Factors have been used  
for computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer for<br>each hour during the<br>month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture for each hour<br>during the<br>month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|---------------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                                | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                                   | o    | o     |
| Mid-<br>night. | 29.514                                          | 29.659                                                       | 29.272  | 0.387   | 81.7                          | 86.9                                                                | 78.2 | 8.7   |
| 1              | .517                                            | .659                                                         | .238    | .421    | 81.6                          | 86.8                                                                | 78.0 | 8.8   |
| 2              | .506                                            | .652                                                         | .220    | .432    | 81.4                          | 86.8                                                                | 77.8 | 9.0   |
| 3              | .511                                            | .656                                                         | .264    | .392    | 81.0                          | 86.5                                                                | 78.0 | 8.5   |
| 4              | .499                                            | .642                                                         | .189    | .453    | 81.1                          | 86.0                                                                | 78.4 | 7.6   |
| 5              | .498                                            | .650                                                         | .196    | .454    | 81.0                          | 85.8                                                                | 78.4 | 7.4   |
| 6              | .512                                            | .659                                                         | .211    | .448    | 81.3                          | 86.2                                                                | 78.2 | 8.0   |
| 7              | .527                                            | .727                                                         | .240    | .487    | 82.2                          | 87.0                                                                | 78.6 | 8.4   |
| 8              | .540                                            | .738                                                         | .261    | .477    | 84.3                          | 90.0                                                                | 79.2 | 10.8  |
| 9              | .546                                            | .734                                                         | .283    | .451    | 85.8                          | 92.2                                                                | 79.2 | 13.0  |
| 10             | .546                                            | .720                                                         | .291    | .429    | 87.4                          | 94.6                                                                | 78.0 | 16.6  |
| 11             | .537                                            | .712                                                         | .276    | .436    | 88.4                          | 95.8                                                                | 78.0 | 17.8  |
| Noon.          | .523                                            | .690                                                         | .275    | .415    | 88.2                          | 96.6                                                                | 78.3 | 18.3  |
| 1              | .503                                            | .687                                                         | .255    | .432    | 88.0                          | 97.8                                                                | 79.1 | 18.7  |
| 2              | .484                                            | .655                                                         | .248    | .407    | 87.6                          | 98.6                                                                | 80.9 | 17.7  |
| 3              | .469                                            | .625                                                         | .226    | .399    | 87.6                          | 97.4                                                                | 79.4 | 18.0  |
| 4              | .456                                            | .624                                                         | .213    | .411    | 87.5                          | 97.4                                                                | 78.9 | 18.5  |
| 5              | .456                                            | .621                                                         | .199    | .422    | 86.7                          | 96.3                                                                | 78.8 | 17.5  |
| 6              | .464                                            | .625                                                         | .215    | .410    | 85.7                          | 94.6                                                                | 77.8 | 16.8  |
| 7              | .484                                            | .636                                                         | .246    | .390    | 84.5                          | 90.8                                                                | 78.0 | 12.8  |
| 8              | .508                                            | .650                                                         | .256    | .394    | 83.7                          | 89.0                                                                | 78.0 | 11.0  |
| 9              | .524                                            | .688                                                         | .273    | .415    | 83.0                          | 88.2                                                                | 78.0 | 10.2  |
| 10             | .524                                            | .692                                                         | .295    | .397    | 82.4                          | 87.8                                                                | 78.2 | 9.6   |
| 11             | .531                                            | .691                                                         | .288    | .403    | 81.9                          | 87.4                                                                | 77.0 | 10.4  |

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Hour.          | Mean Wet Bulb Ther-<br>mometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force<br>of Vapour. | Mean Weight of Va-<br>pour in a Cubic<br>foot of air. | Additional Weight of<br>Vapour required<br>for complete satu-<br>ration. | Mean degree of Hu-<br>midity, complete<br>saturation being<br>unity. |
|----------------|---------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|
|                | o                               | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                                |                                                                      |
| Mid-<br>night. | 78.8                            | 2.9                 | 76.8                | 4.9                          | 0.905                            | 9.73                                                  | 1.64                                                                     | 0.86                                                                 |
| 1              | 78.8                            | 2.8                 | 76.8                | 4.8                          | .905                             | .73                                                   | .61                                                                      | .86                                                                  |
| 2              | 78.7                            | 2.7                 | 76.8                | 4.6                          | .905                             | .73                                                   | .54                                                                      | .86                                                                  |
| 3              | 78.5                            | 2.5                 | 76.7                | 4.3                          | .902                             | .72                                                   | .42                                                                      | .87                                                                  |
| 4              | 78.6                            | 2.5                 | 76.8                | 4.3                          | .905                             | .75                                                   | .42                                                                      | .87                                                                  |
| 5              | 78.6                            | 2.4                 | 76.9                | 4.1                          | .908                             | .78                                                   | .36                                                                      | .88                                                                  |
| 6              | 78.8                            | 2.5                 | 77.0                | 4.3                          | .910                             | .81                                                   | .43                                                                      | .87                                                                  |
| 7              | 79.4                            | 2.8                 | 77.4                | 4.8                          | .922                             | .91                                                   | .63                                                                      | .86                                                                  |
| 8              | 80.5                            | 3.8                 | 77.8                | 6.5                          | .934                             | .99                                                   | 2.29                                                                     | .81                                                                  |
| 9              | 81.0                            | 4.8                 | 77.6                | 8.2                          | .928                             | .91                                                   | .92                                                                      | .77                                                                  |
| 10             | 81.6                            | 5.8                 | 78.1                | 9.3                          | .943                             | 10.04                                                 | 3.41                                                                     | .75                                                                  |
| 11             | 81.5                            | 6.9                 | 77.4                | 11.0                         | .922                             | 9.79                                                  | 4.05                                                                     | .71                                                                  |
| Noon.          | 81.3                            | 6.9                 | 77.2                | 11.0                         | .916                             | .73                                                   | .03                                                                      | .71                                                                  |
| 1              | 81.3                            | 6.7                 | 77.3                | 10.7                         | .919                             | .76                                                   | 3.92                                                                     | .71                                                                  |
| 2              | 81.1                            | 6.5                 | 77.2                | 10.4                         | .916                             | .75                                                   | .77                                                                      | .72                                                                  |
| 3              | 81.2                            | 6.4                 | 77.4                | 10.2                         | .922                             | .81                                                   | .71                                                                      | .73                                                                  |
| 4              | 81.4                            | 6.1                 | 77.7                | 9.8                          | .931                             | .90                                                   | .59                                                                      | .73                                                                  |
| 5              | 80.9                            | 5.8                 | 77.4                | 9.3                          | .922                             | .83                                                   | .35                                                                      | .75                                                                  |
| 6              | 80.6                            | 5.1                 | 77.0                | 8.7                          | .910                             | .71                                                   | .09                                                                      | .76                                                                  |
| 7              | 80.2                            | 4.3                 | 77.2                | 7.3                          | .916                             | .81                                                   | 2.54                                                                     | .79                                                                  |
| 8              | 80.0                            | 3.7                 | 77.4                | 6.3                          | .922                             | .89                                                   | .18                                                                      | .82                                                                  |
| 9              | 79.5                            | 3.5                 | 77.0                | 6.0                          | .910                             | .77                                                   | .05                                                                      | .83                                                                  |
| 10             | 79.2                            | 3.2                 | 77.0                | 5.4                          | .910                             | .79                                                   | 1.82                                                                     | .84                                                                  |
| 11             | 78.7                            | 3.2                 | 76.5                | 5.4                          | .896                             | .65                                                   | .79                                                                      | .85                                                                  |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January, 1863, the Greenwich New Factors have been used  
for Computing Dew-point.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                                                 |
|-------|-----------------------|---------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches.                         |                                   |                                                                                                                                                            |
| 1     | 131.6                 | ...                             | S. & S. E.                        | Cloudy till 10 A. M. Scatd. clouds till 5 P. M. cloudless afterwards.                                                                                      |
| 2     | 131.8                 | ...                             | S.                                | Cloudy till 9 A. M. Scatd. clouds till 7 P. M. cloudy with thunder and lightning afterwards; also slightly drizzling at 11 P. M.                           |
| 3     | 133.0                 | ...                             | S. & E.                           | Cloudy till 6 A. M. Scatd. \i & \i afterwards; also slightly drizzling at Mid-night.                                                                       |
| 4     | 127.4                 | ...                             | S. E. & S.                        | Scatd. \i till Noon; cloudless till 4 P. M. Flying clouds afterwards.                                                                                      |
| 5     | 129.0                 | ...                             | S. & S. E.                        | Cloudy (high wind throughout.)                                                                                                                             |
| 6     | 124.0                 | ...                             | S. & S. E.                        | Cloudy till 7 A. M. Scatd. clouds till 7 P. M. cloudy afterwards; also raining at 8 & 11 P. M. and lightning at 8 & 9 P. M.                                |
| 7     | ...                   | 1.03                            | <i>Sunday.</i>                    |                                                                                                                                                            |
| 8     | ...                   | 0.12                            | S. E. & S.                        | Cloudless till 4 A. M. cloudy afterwards; also thundering at Noon & lightning between 8 & 10 P. M. & raining between 10 & 11 A. M. & drizzling at 10 P. M. |
| 9     | ...                   | ...                             | S. & W. & S. E.                   | Scatd. \i till 4 A. M. cloudy till 6 P. M. Scatd. \i & \i afterwards also lightning at 11 P. M. & drizzling between 10 & 11 A. M.                          |
| 10    | 115.0                 | ...                             | S. & Calm.                        | Cloudy till 7 A. M. Scatd. \i & \i till 1 P. M. cloudy afterwards; also thunder & lightning at 1 A. M. & 3 P. M. & drizzling at 7 & 8 P. M.                |
| 11    | 120.0                 | 1.17                            | S. W. & S. & S. E.                | Cloudy; also occasionally raining.                                                                                                                         |
| 12    | ...                   | 0.22                            | Variable.                         | Cloudy; also raining at 3 & 4 A. M.                                                                                                                        |
| 13    | ...                   | 0.37                            | S. & S. E.                        | Cloudless till 5 A. M. cloudy afterwards; also drizzling at Noon 1 & 3 P. M.                                                                               |
| 14    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                                                            |
| 15    | ...                   | 0.40                            | S. E. & S.                        | Cloudy; also raining at 2 A. M. Noon & 1 P. M.                                                                                                             |
| 16    | ...                   | 1.28                            | S. E. & E.                        | Cloudy till 7 P. M. cloudless afterwards; also raining at 10 A. M. & between 11 & Noon.                                                                    |
| 17    | 115.2                 | 0.22                            | S. E. & E.                        | Cloudless till 5 A. M. Scatd. \i till 9 A. M. Scatd. \i till 8 P. M. cloudless afterwards also raining between 5 & 6 P. M.                                 |



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                       |
|-------|-----------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|       | °                     | Inches                          |                                   |                                                                                                                                  |
| 18    | ...                   | 0.79                            | S. E. & N. E. & S.                | Cloudless till 5 A. M. cloudy till 6 P. M. Scatd. clouds afterwards; also raining between Noon & 1 P. M. & thundering at 1 P. M. |
| 19    | 116.2                 | 0.73                            | E. & N. E.                        | Cloudy; also raining at 4 A. M. 2 & 5 P. M.                                                                                      |
| 20    | ...                   | 0.13                            | E. & N. E.                        | Cloudy; also occasionally drizzling.                                                                                             |
| 21    | ...                   | 1.07                            | Sunday.                           |                                                                                                                                  |
| 22    | ...                   | 3.19                            | S. W. & S. E.                     | Cloudy; also raining between 5 & 8 P. M. & lightning & thundering at 6 P. M.                                                     |
| 23    | ...                   | 0.32                            | S. W. & S.                        | Cloudy; also drizzling at 5 A. M. Noon, & from 7 to 9 P. M. & thundering at 8 P. M.                                              |
| 24    | ...                   | 0.37                            | S. & W.                           | Cloudy; also drizzling constantly from Midnight to 1 P. M.                                                                       |
| 25    | 120.0                 | ...                             | N. & N. E.                        | Cloudy; also slightly drizzling between 8 & 9 A. M. & 11 A. M. & Noon.                                                           |
| 26    | ...                   | 0.42                            | N. E. & N.                        | Cloudy; also drizzling constantly.                                                                                               |
| 27    | ...                   | 0.18                            | S. E. & S. & N. E.                | Cloudy; also drizzling from 1 to 8 P. M.                                                                                         |
| 28    | ...                   | 0.38                            | Sunday.                           |                                                                                                                                  |
| 29    | 122.7                 | ...                             | S.                                | Scatd. ☼i & ☾i; also drizzling between 11 & Noon.                                                                                |
| 30    | 115.0                 | 0.54                            | S. & N. W.                        | Cloudy till 7 A. M. Scatd. ☼i till 1 P. M. cloudy afterwards & thundering at 3 P. M. also raining at 6 A. M. 5 & 7 P. M.         |

☼i Cirri, ☼i Cirro strati, ☾i Cumuli, ☾i Cumulo strati, ☼i Nimbi, —i Strati, ☼i Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

MONTHLY RESULTS.

|                                                               |    |    | Inches |
|---------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month,                   | .. | .. | 29.507 |
| Max. height of the Barometer occurred at 8 A. M. on the 9th,  | .. | .. | 29.738 |
| Min. height of the Barometer occurred at 4 A. M. on the 27th, | .. | .. | 29.189 |
| <i>Extreme range</i> of the Barometer during the month,       | .. | .. | 0.549  |
| Mean of the daily Max. Pressures,                             | .. | .. | 29.569 |
| Ditto ditto Min. ditto,                                       | .. | .. | 29.442 |
| <i>Mean daily range</i> of the Barometer during the month,    | .. | .. | 0.127  |

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|                                                              |    |    | o    |
|--------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month,                     | .. | .. | 84.4 |
| Max. Temperature occurred at 2 P. M. on the 2nd,             | .. | .. | 98.6 |
| Min. Temperature occurred at 11 P. M. on the 6th,            | .. | .. | 77.0 |
| <i>Extreme range</i> of the Temperature during the month,    | .. | .. | 21.6 |
| Mean of the daily Max. Temperature,                          | .. | .. | 90.0 |
| Ditto ditto Min. ditto,                                      | .. | .. | 79.9 |
| <i>Mean daily range</i> of the Temperature during the month, | .. | .. | 10.1 |

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|                                                               |    |    | o      |
|---------------------------------------------------------------|----|----|--------|
| Mean Wet Bulb Thermometer for the month,                      | .. | .. | 80.0   |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, .. |    |    | 4.4    |
| Computed Mean Dew-point for the month,                        | .. | .. | 76.9   |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, ..   |    |    | 7.5    |
|                                                               |    |    | Inches |
| Mean Elastic force of Vapour for the month, ..                | .. | .. | 0.908  |

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|                                                                         |    |    | Troy grains |
|-------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month,                                    | .. | .. | 9.70        |
| Additional Weight of Vapour required for complete saturation,           | .. | .. | 2.61        |
| Mean degree of humidity for the month, complete saturation being unity, |    |    | 0.79        |

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|                                                    |    |    | Inches     |
|----------------------------------------------------|----|----|------------|
| Rained 26 days, Max. fall of rain during 24 hours, | .. | .. | 3.19       |
| Total amount of rain during the month,             | .. | .. | 12.93      |
| Prevailing direction of the Wind,                  | .. | .. | S. & S. E. |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of June, 1863.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind  
blew, together with the number of days on which at the same hour,  
when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on. | N. E. | Rain on. | E. | Rain on. | S. E. | Rain on. | S. | Rain on. | S. W. | Rain on. | W. | Rain on. | N. W. | Rain on. | Calm. | Rain on. | Missed. |
|-----------|--------------|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|----|----------|-------|----------|-------|----------|---------|
|           | No. of days. |          |       |          |    |          |       |          |    |          |       |          |    |          |       |          |       |          |         |
| Midnight. | 2            |          |       |          | 1  | 1        | 5     |          | 12 | 1        |       |          | 1  |          | 1     |          | 1     |          | 3       |
| 1         | 1            | 1        | 1     |          | 1  |          | 6     |          | 12 | 1        |       |          | 1  |          |       |          | 4     |          |         |
| 2         | 1            | 1        | 1     |          | 1  |          | 8     |          | 9  | 2        | 1     |          | 1  |          |       |          | 4     |          |         |
| 3         | 1            | 1        | 1     | 1        | 1  |          | 9     | 1        | 8  | 1        | 1     |          |    |          |       |          | 3     |          | 2       |
| 4         |              |          | 3     | 1        | 3  | 1        | 7     | 1        | 8  | 1        | 1     |          |    |          | 1     |          | 1     |          | 2       |
| 5         | 3            | 1        | 2     |          | 1  |          | 6     |          | 7  | 2        | 1     | 1        |    |          |       |          | 1     |          | 5       |
| 6         | 3            |          | 3     |          | 5  |          | 6     |          | 6  | 1        | 2     | 2        | 1  | 1        |       |          |       |          |         |
| 7         | 2            |          | 4     |          | 4  |          | 6     |          | 6  |          | 3     | 3        | 1  |          |       |          |       |          |         |
| 8         | 2            | 1        | 2     |          | 6  |          | 4     |          | 8  | 1        | 3     | 3        | 1  |          |       |          |       |          |         |
| 9         | 1            |          | 3     | 1        | 5  |          | 2     |          | 10 |          | 2     | 2        | 3  | 1        |       |          |       |          |         |
| 10        | 1            | 1        | 3     |          | 6  | 1        | 2     |          | 6  |          | 4     |          | 4  | 2        |       |          |       |          |         |
| 11        |              |          | 2     |          | 4  |          | 4     |          | 6  | 1        | 7     |          | 2  | 2        | 1     |          |       |          |         |
| Noon.     |              |          | 2     | 2        | 5  | 1        | 4     |          | 7  | 1        | 3     | 2        | 3  | 1        | 2     | 1        |       |          |         |
| 1         |              |          |       |          | 2  |          | 8     | 3        | 9  | 1        | 4     |          | 1  | 1        | 2     | 1        |       |          |         |
| 2         | 2            |          | 2     | 1        | 4  | 1        | 4     | 1        | 11 | 1        | 2     |          | 1  |          |       |          |       |          |         |
| 3         |              |          | 2     | 1        | 4  |          | 4     |          | 9  | 1        | 4     | 1        | 1  |          |       |          |       |          |         |
| 4         |              |          | 4     | 1        | 2  | 1        | 9     | 1        | 5  |          | 4     | 1        | 1  |          | 1     |          |       |          |         |
| 5         | 1            |          | 3     | 1        | 1  |          | 11    | 2        | 8  | 1        |       |          | 2  | 1        |       |          |       |          |         |
| 6         | 1            |          | 1     | 1        | 1  |          | 9     | 1        | 13 | 1        |       |          | 1  | 1        |       |          |       |          |         |
| 7         | 1            |          | 1     | 1        | 1  |          | 7     | 1        | 14 | 2        | 2     | 1        |    |          |       |          |       |          |         |
| 8         | 1            |          | 1     | 1        | 3  | 1        | 5     | 1        | 13 | 4        | 2     | 1        |    |          |       |          | 1     | 1        |         |
| 9         | 1            |          | 2     |          | 2  | 1        | 4     | 1        | 13 | 1        | 2     |          |    |          |       |          | 2     |          |         |
| 10        | 1            |          | 1     |          | 2  |          | 5     |          | 11 |          | 2     |          | 1  |          |       |          | 1     | 1        |         |
| 11        | 1            |          | 1     |          | 4  | 3        | 5     |          | 10 |          | 2     |          | 2  |          |       |          | 1     |          | 2       |

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1863.*

Latitude 22° 33' 1" North. Longitude 88° 20' 34" East.

Feet.

Height of the Cistern of the Standard Barometer above the Sea-level, 18.11

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Date. | Mean Height of<br>the Barometer<br>at 32° Fahr. | Range of the Barometer<br>during the day. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Tempera-<br>ture during the day. |      |       |
|-------|-------------------------------------------------|-------------------------------------------|---------|---------|-------------------------------|-----------------------------------------------|------|-------|
|       |                                                 | Max.                                      | Min.    | Diff.   |                               | Max.                                          | Min. | Diff. |
|       | Inches.                                         | Inches.                                   | Inches. | Inches. | °                             | °                                             | °    | °     |
| 1     | 29.472                                          | 29.533                                    | 29.399  | 0.134   | 82.8                          | 87.0                                          | 80.0 | 7.0   |
| 2     | .434                                            | .475                                      | .364    | .111    | 83.9                          | 88.7                                          | 80.0 | 8.7   |
| 3     | .410                                            | .456                                      | .343    | .113    | 85.0                          | 91.3                                          | 80.4 | 10.9  |
| 4     | .462                                            | .534                                      | .407    | .127    | 82.1                          | 84.1                                          | 80.0 | 4.1   |
| 5     | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 6     | .519                                            | .567                                      | .472    | .095    | 83.3                          | 86.9                                          | 81.4 | 5.5   |
| 7     | .565                                            | .643                                      | .511    | .132    | 83.2                          | 88.6                                          | 80.2 | 8.4   |
| 8     | .612                                            | .670                                      | .559    | .111    | 82.9                          | 89.2                                          | 79.5 | 9.7   |
| 9     | .622                                            | .679                                      | .574    | .105    | 83.5                          | 88.8                                          | 79.9 | 8.9   |
| 10    | .645                                            | .688                                      | .600    | .088    | 83.8                          | 88.4                                          | 80.0 | 8.4   |
| 11    | .620                                            | .665                                      | .548    | .117    | 83.9                          | 89.8                                          | 80.4 | 9.4   |
| 12    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 13    | .580                                            | .627                                      | .515    | .112    | 85.1                          | 89.7                                          | 81.2 | 8.5   |
| 14    | .574                                            | .615                                      | .513    | .102    | 84.4                          | 89.5                                          | 80.4 | 9.1   |
| 15    | .535                                            | .592                                      | .474    | .118    | 82.9                          | 89.3                                          | 81.0 | 8.3   |
| 16    | .495                                            | .543                                      | .443    | .100    | 82.7                          | 87.1                                          | 80.4 | 6.7   |
| 17    | .461                                            | .502                                      | .402    | .100    | 82.6                          | 85.7                                          | 79.9 | 5.8   |
| 18    | .396                                            | .464                                      | .312    | .152    | 82.7                          | 88.5                                          | 80.2 | 8.3   |
| 19    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 20    | .528                                            | .589                                      | .484    | .105    | 83.3                          | 87.5                                          | 79.2 | 8.3   |
| 21    | .575                                            | .622                                      | .528    | .094    | 83.3                          | 87.6                                          | 80.2 | 7.4   |
| 22    | .594                                            | .641                                      | .543    | .098    | 84.2                          | 89.7                                          | 80.8 | 8.9   |
| 23    | .569                                            | .617                                      | .496    | .121    | 83.5                          | 89.7                                          | 81.0 | 8.7   |
| 24    | .525                                            | .585                                      | .461    | .124    | 84.7                          | 89.9                                          | 80.9 | 9.0   |
| 25    | .501                                            | .550                                      | .410    | .140    | 85.5                          | 92.4                                          | 81.6 | 10.8  |
| 26    | Sunday.                                         |                                           |         |         |                               |                                               |      |       |
| 27    | .454                                            | .515                                      | .368    | .147    | 82.2                          | 87.2                                          | 79.0 | 8.2   |
| 28    | .463                                            | .512                                      | .415    | .097    | 83.5                          | 88.7                                          | 80.6 | 8.1   |
| 29    | .475                                            | .513                                      | .424    | .089    | 81.7                          | 85.5                                          | 79.0 | 6.5   |
| 30    | .436                                            | .488                                      | .371    | .117    | 82.7                          | 86.8                                          | 78.8 | 8.0   |
| 31    | .505                                            | .564                                      | .456    | .108    | 83.5                          | 87.6                                          | 80.3 | 7.3   |

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the hourly Observations made during the day.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1863.*

Daily Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued).

| Date. | Mean Wet Bulb Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew Point. | Mean Elastic force of Vapour. | Mean Weight of Vapour in a Cubic foot of air. | Additional Weight of Vapour required for complete saturation. | Mean degree of Humidity, complete saturation being unity. |
|-------|----------------------------|---------------------|---------------------|---------------------------|-------------------------------|-----------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|
|       | °                          | °                   | °                   | °                         | Inches.                       | T. gr.                                        | T. gr.                                                        |                                                           |
| 1     | 79.4                       | 3.4                 | 77.0                | 5.8                       | 0.910                         | 9.77                                          | 1.98                                                          | 0.83                                                      |
| 2     | 80.6                       | 3.3                 | 78.3                | 5.6                       | .949                          | 10.16                                         | .97                                                           | .84                                                       |
| 3     | 80.8                       | 4.2                 | 77.9                | 7.1                       | .937                          | .02                                           | 2.51                                                          | .80                                                       |
| 4     | 79.8                       | 2.3                 | 78.2                | 3.9                       | .946                          | .17                                           | 1.34                                                          | .88                                                       |
| 5     | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 6     | 79.6                       | 3.7                 | 77.0                | 6.3                       | .910                          | 9.77                                          | 2.16                                                          | .82                                                       |
| 7     | 79.1                       | 4.1                 | 76.2                | 7.0                       | .887                          | .52                                           | .37                                                           | .80                                                       |
| 8     | 78.8                       | 4.1                 | 75.9                | 7.0                       | .879                          | .44                                           | .35                                                           | .80                                                       |
| 9     | 79.4                       | 4.1                 | 76.5                | 7.0                       | .896                          | .61                                           | .39                                                           | .80                                                       |
| 10    | 79.6                       | 4.2                 | 76.7                | 7.1                       | .902                          | .66                                           | .44                                                           | .80                                                       |
| 11    | 79.8                       | 4.1                 | 76.9                | 7.0                       | .908                          | .72                                           | .41                                                           | .80                                                       |
| 12    | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 13    | 80.8                       | 4.3                 | 77.8                | 7.3                       | .934                          | .99                                           | .58                                                           | .80                                                       |
| 14    | 80.3                       | 4.1                 | 77.4                | 7.0                       | .922                          | .87                                           | .44                                                           | .80                                                       |
| 15    | 79.8                       | 3.1                 | 77.6                | 5.3                       | .928                          | .97                                           | 1.82                                                          | .85                                                       |
| 16    | 79.8                       | 2.9                 | 77.8                | 4.9                       | .934                          | 10.03                                         | .69                                                           | .86                                                       |
| 17    | 79.4                       | 3.2                 | 77.2                | 5.4                       | .916                          | 9.85                                          | .83                                                           | .84                                                       |
| 18    | 79.7                       | 3.0                 | 77.6                | 5.1                       | .928                          | .97                                           | .75                                                           | .85                                                       |
| 19    | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 20    | 79.3                       | 4.0                 | 76.5                | 6.8                       | .896                          | .61                                           | 2.32                                                          | .81                                                       |
| 21    | 79.9                       | 3.4                 | 77.5                | 5.8                       | .925                          | .92                                           | .01                                                           | .83                                                       |
| 22    | 80.2                       | 4.0                 | 77.4                | 6.8                       | .922                          | .87                                           | .37                                                           | .81                                                       |
| 23    | 80.0                       | 3.5                 | 77.5                | 6.0                       | .925                          | .92                                           | .08                                                           | .83                                                       |
| 24    | 80.8                       | 3.9                 | 78.1                | 6.6                       | .943                          | 10.08                                         | .34                                                           | .81                                                       |
| 25    | 80.7                       | 4.8                 | 77.3                | 8.2                       | .919                          | 9.82                                          | .90                                                           | .77                                                       |
| 26    | Sunday.                    |                     |                     |                           |                               |                                               |                                                               |                                                           |
| 27    | 79.2                       | 3.0                 | 77.1                | 5.1                       | .913                          | .82                                           | 1.72                                                          | .85                                                       |
| 28    | 79.9                       | 3.6                 | 77.4                | 6.1                       | .922                          | .89                                           | 2.11                                                          | .82                                                       |
| 29    | 78.9                       | 2.8                 | 76.9                | 4.8                       | .908                          | .76                                           | 1.61                                                          | .86                                                       |
| 30    | 79.5                       | 3.2                 | 77.3                | 5.4                       | .919                          | .88                                           | .84                                                           | .84                                                       |
| 31    | 79.2                       | 4.3                 | 76.2                | 7.3                       | .887                          | .52                                           | 2.48                                                          | .79                                                       |

All the Hygrometrical elements are computed by the Greenwich Constants.  
From the 1st January, 1863, the Greenwich New Factors have been used for  
computing Dew-points.



*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.

| Hour.          | Mean Height of<br>the Barometer<br>at 32° Falt. | Range of the Barometer<br>for each hour during<br>the month. |         |         | Mean Dry Bulb<br>Thermometer. | Range of the Temperature<br>for each hour during<br>the month. |      |       |
|----------------|-------------------------------------------------|--------------------------------------------------------------|---------|---------|-------------------------------|----------------------------------------------------------------|------|-------|
|                |                                                 | Max.                                                         | Min.    | Diff.   |                               | Max.                                                           | Min. | Diff. |
|                | Inches.                                         | Inches.                                                      | Inches. | Inches. | o                             | o                                                              | o    | o     |
| Mid-<br>night. | 29.534                                          | 29.665                                                       | 29.422  | 0.243   | 81.6                          | 83.0                                                           | 80.4 | 2.6   |
| 1              | .526                                            | .645                                                         | .398    | .247    | 81.3                          | 82.8                                                           | 80.0 | 2.8   |
| 2              | .519                                            | .636                                                         | .391    | .245    | 81.1                          | 82.7                                                           | 79.8 | 2.9   |
| 3              | .509                                            | .623                                                         | .389    | .234    | 80.9                          | 82.5                                                           | 79.6 | 2.9   |
| 4              | .513                                            | .621                                                         | .385    | .236    | 80.8                          | 82.4                                                           | 79.6 | 2.8   |
| 5              | .509                                            | .631                                                         | .398    | .233    | 80.6                          | 82.3                                                           | 78.8 | 3.5   |
| 6              | .528                                            | .651                                                         | .408    | .243    | 80.6                          | 82.2                                                           | 79.0 | 3.2   |
| 7              | .541                                            | .665                                                         | .423    | .242    | 81.3                          | 83.2                                                           | 79.8 | 3.4   |
| 8              | .550                                            | .668                                                         | .430    | .238    | 82.9                          | 85.4                                                           | 79.0 | 6.4   |
| 9              | .560                                            | .683                                                         | .437    | .246    | 84.0                          | 86.7                                                           | 79.5 | 7.2   |
| 10             | .560                                            | .687                                                         | .429    | .258    | 85.2                          | 88.0                                                           | 80.3 | 7.7   |
| 11             | .554                                            | .688                                                         | .420    | .268    | 86.0                          | 89.0                                                           | 81.4 | 7.6   |
| Noon.          | .538                                            | .679                                                         | .395    | .284    | 87.1                          | 91.1                                                           | 83.0 | 8.1   |
| 1              | .519                                            | .655                                                         | .370    | .285    | 86.6                          | 91.3                                                           | 82.0 | 9.3   |
| 2              | .497                                            | .631                                                         | .349    | .282    | 86.7                          | 91.3                                                           | 82.8 | 8.5   |
| 3              | .480                                            | .616                                                         | .329    | .287    | 86.8                          | 92.4                                                           | 81.0 | 11.4  |
| 4              | .465                                            | .609                                                         | .316    | .393    | 85.8                          | 89.5                                                           | 81.1 | 8.4   |
| 5              | .464                                            | .600                                                         | .312    | .288    | 85.0                          | 87.8                                                           | 81.6 | 6.2   |
| 6              | .470                                            | .609                                                         | .324    | .285    | 84.3                          | 87.4                                                           | 82.2 | 5.2   |
| 7              | .494                                            | .625                                                         | .354    | .271    | 83.4                          | 85.6                                                           | 81.4 | 4.2   |
| 8              | .514                                            | .641                                                         | .381    | .260    | 82.9                          | 85.2                                                           | 81.2 | 4.0   |
| 9              | .533                                            | .660                                                         | .400    | .260    | 82.6                          | 85.0                                                           | 80.4 | 4.6   |
| 10             | .546                                            | .670                                                         | .421    | .249    | 82.2                          | 84.7                                                           | 80.4 | 4.3   |
| 11             | .543                                            | .678                                                         | .422    | .256    | 81.9                          | 84.5                                                           | 80.4 | 4.1   |

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the Observations made at the several hours during the month.

*Abstract of the Results of the Hourly Meteorological Observations  
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in the month of July, 1863.*

Hourly Means, &c. of the Observations and of the Hygrometrical elements  
dependent thereon.—(Continued.)

| Hour.          | Mean Wet Bulb<br>Thermometer. | Dry Bulb above Wet. | Computed Dew Point. | Dry Bulb above Dew<br>Point. | Mean Elastic force of<br>Vapour. | Mean Weight of Va-<br>pour in a Cubic foot<br>of air. | Additional Weight of<br>Vapour required for<br>complete saturation. | Mean degree of Hu-<br>midity, complete satu-<br>ration being unity. |
|----------------|-------------------------------|---------------------|---------------------|------------------------------|----------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
|                | o                             | o                   | o                   | o                            | Inches.                          | Troy grs.                                             | Troy grs.                                                           |                                                                     |
| Mid-<br>night. | 79.0                          | 2.6                 | 77.2                | 4.4                          | 0.916                            | 9.87                                                  | 1.47                                                                | 0.87                                                                |
| 1              | 79.0                          | 2.3                 | 77.4                | 3.9                          | .922                             | .93                                                   | .31                                                                 | .88                                                                 |
| 2              | 78.9                          | 2.2                 | 77.4                | 3.7                          | .922                             | .93                                                   | .24                                                                 | .89                                                                 |
| 3              | 78.7                          | 2.2                 | 77.2                | 3.7                          | .916                             | .87                                                   | .23                                                                 | .89                                                                 |
| 4              | 78.6                          | 2.2                 | 77.1                | 3.7                          | .913                             | .84                                                   | .23                                                                 | .89                                                                 |
| 5              | 78.4                          | 2.2                 | 76.9                | 3.7                          | .908                             | .78                                                   | .23                                                                 | .89                                                                 |
| 6              | 78.6                          | 2.0                 | 77.2                | 3.4                          | .916                             | .89                                                   | .12                                                                 | .90                                                                 |
| 7              | 78.9                          | 2.4                 | 77.2                | 4.1                          | .916                             | .87                                                   | .37                                                                 | .88                                                                 |
| 8              | 79.5                          | 3.4                 | 77.1                | 5.8                          | .913                             | .80                                                   | .99                                                                 | .83                                                                 |
| 9              | 79.9                          | 4.1                 | 77.0                | 7.9                          | .910                             | .75                                                   | 2.42                                                                | .80                                                                 |
| 10             | 80.2                          | 5.0                 | 76.7                | 8.5                          | .902                             | .62                                                   | .99                                                                 | .76                                                                 |
| 11             | 80.7                          | 5.3                 | 77.0                | 9.0                          | .910                             | .71                                                   | 3.20                                                                | .75                                                                 |
| Noon.          | 81.2                          | 5.9                 | 77.7                | 9.4                          | .931                             | .92                                                   | .41                                                                 | .74                                                                 |
| 1              | 81.0                          | 5.6                 | 77.6                | 9.0                          | .928                             | .89                                                   | .25                                                                 | .75                                                                 |
| 2              | 81.0                          | 5.7                 | 77.6                | 9.1                          | .928                             | .89                                                   | .29                                                                 | .75                                                                 |
| 3              | 80.9                          | 5.9                 | 77.4                | 9.4                          | .922                             | .83                                                   | .38                                                                 | .74                                                                 |
| 4              | 80.9                          | 4.9                 | 77.5                | 8.3                          | .925                             | .88                                                   | 2.95                                                                | .77                                                                 |
| 5              | 80.7                          | 4.3                 | 77.7                | 7.3                          | .931                             | .96                                                   | .57                                                                 | .80                                                                 |
| 6              | 80.3                          | 4.0                 | 77.5                | 6.8                          | .925                             | .90                                                   | .38                                                                 | .81                                                                 |
| 7              | 80.1                          | 3.3                 | 77.8                | 5.6                          | .934                             | 10.01                                                 | 1.95                                                                | .84                                                                 |
| 8              | 79.8                          | 3.1                 | 77.6                | 5.3                          | .928                             | 9.97                                                  | .82                                                                 | .85                                                                 |
| 9              | 79.5                          | 3.1                 | 77.3                | 5.3                          | .919                             | .88                                                   | .80                                                                 | .85                                                                 |
| 10             | 79.3                          | 2.9                 | 77.3                | 4.9                          | .919                             | .88                                                   | .66                                                                 | .86                                                                 |
| 11             | 79.2                          | 2.7                 | 77.3                | 4.6                          | .919                             | .88                                                   | .56                                                                 | .86                                                                 |

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From the 1st January, 1863, the Greenwich New Factors have been used for  
computing Dew-points.

*Abstract of the Results of the Hourly Meteorological Observations  
taken at the Surveyor General's Office, Calcutta,  
in the month of July, 1863.*

Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                                                  |
|-------|-----------------------|---------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | 0                     | Inches                          |                                   |                                                                                                                                                             |
| 1     | ...                   | 1.44                            | W. & S. & S. W.                   | Cloudy; also raining at Midnight, at 9 & 10 A. M. and at 8 & 9 P. M.                                                                                        |
| 2     | 117.0                 | 0.44                            | S.                                | Scatd. $\searrow$ i till 7 A. M. cloudy afterwards; also raining between 10 & 11 A. M. and 3 & 4 P. M. and at 11 P. M.                                      |
| 3     | 125.0                 | 1.20                            | S. & E.                           | Cloudy till 9 A. M.; Scatd. $\searrow$ i and $\nearrow$ i till 4 P. M. cloudy afterwards; also raining between 3 & 4 P. M. and from 6 to 10 P. M.           |
| 4     | ...                   | 0.10                            | S.                                | Cloudy; also drizzling from 11 A. M. to 2 P. M.                                                                                                             |
| 5     | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                                                             |
| 6     | ...                   | ...                             | S.                                | Cloudy till 7 P. M. cloudless afterwards; also slightly drizzling between 1 and 2 P. M.                                                                     |
| 7     | ...                   | ...                             | S. & S. E.                        | Cloudy till 1 P. M. Scatd. $\nearrow$ i and $\searrow$ i afterwards; also slightly drizzling at 7 & 9 A. M.                                                 |
| 8     | 116.0                 | 0.18                            | E.                                | Cloudless till 8 A. M. Scatd. $\nearrow$ i and $\searrow$ i till 8 P. M. cloudless afterwards; also drizzling between 1 & 3 P. M.                           |
| 9     | 113.2                 | 0.14                            | S. E. & S.                        | Scatd. $\searrow$ i till Noon, cloudy afterwards; also raining at 1 P. M.                                                                                   |
| 10    | ...                   | 0.30                            | S. & E.                           | Cloudless till 5 A. M. Scatd. $\searrow$ i & $\nearrow$ i till 7 P. M., cloudless afterwards; also raining between Noon and 1 P. M. and between 1 & 2 P. M. |
| 11    | 114.0                 | ...                             | S. & S. W.                        | Cloudless till 4 A. M. Scatd. $\searrow$ i & $\nearrow$ i till 7 P. M. cloudless afterwards; also very slightly drizzling between noon and 1 P. M.          |
| 12    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                                                             |
| 13    | ...                   | ...                             | S.                                | Cloudless till 4 A. M. cloudy till 7 P. M. cloudless afterwards.                                                                                            |
| 14    | 115.0                 | ...                             | S. & S. W.                        | Cloudless till 4 A. M. cloudy afterwards also drizzling at 4, 6 & 8 P. M.                                                                                   |
| 15    | 121.0                 | 1.14                            | S. & W.                           | Cloudless till 4 A. M. cloudy afterwards; also raining from 1 to 4 P. M.                                                                                    |
| 16    | ...                   | 0.50                            | S.                                | Scatd. $\searrow$ i till 4 A. M. cloudy afterwards; also drizzling after intervals.                                                                         |
| 17    | ...                   | ...                             | S.                                | Cloudy till 8 P. M. cloudless afterwards.                                                                                                                   |
| 18    | ...                   | 0.46                            | S. & S. W.                        | Cloudy; also drizzling after intervals.                                                                                                                     |

*Abstract of the Results of the Hourly Meteorological Observations  
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Solar Radiation, Weather, &c.

| Date. | Max. Solar radiation. | Rain Gauge 5 feet above Ground. | Prevailing direction of the Wind. | General Aspect of the Sky.                                                                                                                                                      |
|-------|-----------------------|---------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | 0                     | Inches.                         |                                   |                                                                                                                                                                                 |
| 19    | ...                   | 0.30                            | <i>Sunday.</i>                    |                                                                                                                                                                                 |
| 20    | 129.9                 | ...                             | S. & S. E.                        | Clondy till 5 A. M. Scatd. $\curvearrowright$ i & $\curvearrowleft$ i till 7 P. M., clondless afterwards; also drizzled at 1 & 11 A. M.                                         |
| 21    | ...                   | 0.31                            | E. & S. E.                        | Clondless till 4 A. M. Scatd. clouds afterwards; also raining between 11 and Noon.                                                                                              |
| 22    | 120.0                 | 0.24                            | E.                                | Scatd. clouds; also raining between 11 and noon, between 4 & 5 P. M. and between 5 & 6 P. M.                                                                                    |
| 23    | 120.0                 | ...                             | S. E. & S. & E.                   | Cloudless till 3 A. M. Scatd. $\curvearrowleft$ i & $\curvearrowright$ i till Noon, clondy till 6 P. M. cloudless afterwards; also drizzling between 1 & 2 P. M. and at 5 P. M. |
| 24    | ...                   | 0.99                            | S. & S. E.                        | Cloudy till 7 P. M. cloudless afterwards; also raining at 11 A. M. and at 4 & 5 P. M.                                                                                           |
| 25    | 115.3                 | ...                             | S. E. & S.                        | Cloudless till 5 A. M. Scatd. $\curvearrowleft$ i & $\curvearrowright$ i afterwards.                                                                                            |
| 26    | ...                   | ...                             | <i>Sunday.</i>                    |                                                                                                                                                                                 |
| 27    | ...                   | 1.96                            | E.                                | Clondy; also incessantly raining from 3 to 10 A. M. and drizzling at 4 & 5 P. M.                                                                                                |
| 28    | 116.0                 | ...                             | S. & S. E.                        | Scatd. clouds till 4 P. M. clondy afterwards; also slightly drizzling at 1 P. M.                                                                                                |
| 29    | ...                   | 1.22                            | S. E. & S.                        | Clondy; also constantly raining.                                                                                                                                                |
| 30    | 110.0                 | 0.30                            | E. & S.                           | Clondy; also constantly drizzling the whole day.                                                                                                                                |
| 31    | ...                   | ...                             | S. & S. W.                        | Clondy; also drizzling between 8 & 9 P. M.                                                                                                                                      |

$\curvearrowright$  i Cirri,  $\curvearrowleft$  i Cirro strati,  $\curvearrowright$  i Cumuli,  $\curvearrowleft$  i Cumulo strati,  $\curvearrowleft$  i Nimbi,—i Strati,  $\curvearrowright$  i Cirro cumuli.

*Abstract of the Results of the Hourly Meteorological Observations  
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in the month of July, 1863.*

MONTHLY RESULTS.

|                                                                |    |    | Inches |
|----------------------------------------------------------------|----|----|--------|
| Mean height of the Barometer for the month, ..                 | .. | .. | 29.519 |
| Max. height of the Barometer occurred at 11 A. M. on the 10th, | .. | .. | 29.688 |
| Min. height of the Barometer occurred at 5 P. M. on the 18th,  | .. | .. | 29.312 |
| <i>Extreme range</i> of the Barometer during the month, ..     | .. | .. | 0.376  |
| Mean of the Daily Max. Pressures, ..                           | .. | .. | 29.572 |
| Ditto ditto Min. ditto, ..                                     | .. | .. | 29.459 |
| <i>Mean daily range</i> of the Barometer during the month, ..  | .. | .. | 0.113  |

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|                                                                 |    |    | o    |
|-----------------------------------------------------------------|----|----|------|
| Mean Dry Bulb Thermometer for the month, ..                     | .. | .. | 83.4 |
| Max. Temperature occurred at 3 P. M. on the 25th,               | .. | .. | 92.4 |
| Min. Temperature occurred at 5 A. M. on the 30th,               | .. | .. | 78.8 |
| <i>Extreme range</i> of the Temperature during the month, ..    | .. | .. | 13.6 |
| Mean of the daily Max. Temperature, ..                          | .. | .. | 88.3 |
| Ditto ditto Min. ditto, ..                                      | .. | .. | 80.2 |
| <i>Mean daily range</i> of the Temperature during the month, .. | .. | .. | 8.1  |
| Mean Wet Bulb Thermometer for the month, ..                     | .. | .. | 79.8 |
| Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer, ..   | .. | .. | 3.6  |
| Computed Mean Dew-point for the month, ..                       | .. | .. | 77.3 |
| Mean Dry Bulb Thermometer above computed Mean Dew-point, ..     | .. | .. | 6.1  |

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|                                                |    |    | Inches |
|------------------------------------------------|----|----|--------|
| Mean Elastic force of Vapour for the month, .. | .. | .. | 0.919  |

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|                                                                            |    |    | Troy grains |
|----------------------------------------------------------------------------|----|----|-------------|
| Mean Weight of Vapour for the month, ..                                    | .. | .. | 9.86        |
| Additional Weight of Vapour required for complete saturation, ..           | .. | .. | 2.10        |
| Mean degree of humidity for the month, complete saturation being unity, .. | .. | .. | 0.82        |

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|                                                       |    |    | Inches          |
|-------------------------------------------------------|----|----|-----------------|
| Rained 25 days, Max. fall of rain during 24 hours, .. | .. | .. | 1.96            |
| Total amount of rain during the month, ..             | .. | .. | 11.22           |
| Prevailing direction of the Wind, ..                  | .. | .. | S. & S. E. & E. |



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in the month of July, 1863.*

MONTHLY RESULTS.

Table showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

| Hour.     | N.           | Rain on.<br>N. E. | Rain on. | E. | Rain on.<br>S. E. | Rain on. | S. | Rain on.<br>S. W. | Rain on. | W. | Rain on.<br>N. W. | Rain on. | Calm. | Rain on. | Missed. |
|-----------|--------------|-------------------|----------|----|-------------------|----------|----|-------------------|----------|----|-------------------|----------|-------|----------|---------|
|           | No. of days. |                   |          |    |                   |          |    |                   |          |    |                   |          |       |          |         |
| Midnight. |              |                   |          | 4  | 2                 | 1        | 12 |                   |          | 1  | 1                 |          | 1     |          | 7       |
| 1         |              |                   |          | 4  | 1                 | 5        | 1  | 15                | 1        | 1  |                   |          | 1     |          | 1       |
| 2         |              |                   |          | 4  | 1                 | 6        | 1  | 15                |          |    |                   |          |       |          | 2       |
| 3         |              |                   |          | 5  | 1                 | 7        | 1  | 14                |          | 1  |                   |          |       |          |         |
| 4         |              |                   |          | 5  | 1                 | 6        |    | 13                |          | 1  |                   |          |       |          | 2       |
| 5         |              |                   |          | 5  | 1                 | 4        |    | 11                | 1        | 2  | 1                 |          |       |          | 4       |
| 6         |              | 1                 |          | 6  | 1                 | 5        | 1  | 12                | 1        | 2  | 1                 |          |       |          |         |
| 7         |              | 1                 |          | 6  | 2                 | 4        |    | 12                | 1        | 3  | 1                 |          |       |          |         |
| 8         | 1            | 1                 |          | 4  | 1                 | 6        | 1  | 11                | 1        | 2  |                   |          |       |          | 2       |
| 9         |              | 3                 | 1        | 6  | 1                 | 3        |    | 10                | 3        | 3  | 2                 |          |       |          |         |
| 10        | 1            | 3                 | 1        | 7  | 1                 | 1        |    | 10                | 1        | 3  | 1                 | 2        |       |          |         |
| 11        |              |                   |          | 7  | 2                 | 5        | 2  | 8                 | 1        | 3  |                   | 3        | 1     | 1        |         |
| Noon.     |              |                   |          | 2  | 7                 | 1        | 7  | 1                 | 8        | 2  | 3                 | 1        |       |          |         |
| 1         | 1            | 2                 | 1        | 2  | 5                 | 1        | 7  | 4                 | 6        | 1  | 4                 | 1        |       |          |         |
| 2         | 2            |                   |          | 2  | 7                 | 1        | 7  | 1                 | 6        | 3  | 2                 | 1        | 1     |          |         |
| 3         | 1            | 1                 | 1        | 1  | 8                 | 1        | 10 |                   | 6        | 2  |                   |          |       |          |         |
| 4         |              |                   |          | 3  | 1                 | 4        | 1  | 12                | 3        | 8  | 2                 |          |       |          |         |
| 5         |              |                   |          | 2  | 2                 | 2        |    | 16                | 1        | 7  | 3                 |          |       |          |         |
| 6         |              |                   |          | 3  | 1                 | 3        |    | 16                | 4        | 4  |                   |          |       |          | 1       |
| 7         |              |                   |          | 6  | 1                 | 2        |    | 15                |          | 3  |                   | 1        |       |          |         |
| 8         |              |                   |          | 6  | 1                 | 3        |    | 16                | 3        | 1  |                   |          |       | 1        |         |
| 9         |              |                   |          | 6  | 1                 | 3        |    | 16                | 1        | 1  | 1                 |          |       | 1        |         |
| 10        |              |                   |          | 5  |                   | 3        |    | 17                | 1        | 1  |                   |          |       | 1        |         |
| 11        |              |                   |          | 4  |                   | 4        |    | 16                | 1        | 1  |                   |          |       | 1        | 1       |



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